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Journal of the AMERICAN STATISTICAL ASSOCIATION

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The 102nd Annual Meeting of the American Statistical Association will be held in Chicago, Illinois, December 26 to 28, 1940. With a few exceptions the sessions are open to the public.

Chapters of the Association have been organized in important cities in the United States. Information concerning the meetings of these chapters may be secured from the District Representatives listed on another page.

The Editors welcome the submission of articles and notes for possible publication in the JOURNAL. Manuscripts should be sent to the Editor, Journal of the American Statistical Association, 1626 K Street, N.W., Washington, D. C. Books for review should be sent to the Review Editor, Glenn E. McLaughlin, 210 Normandy Building, 1626 K St., N. W., Washington, D. C. Authors who wish suggestions about the preparation of manuscripts and charts or information about editorial policies should address their inquiries to the Editor.

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JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION

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HOURLY EARNINGS AND UNIT LABOR COST IN MANUFACTURING*

By Irving H. Siegel
National Bureau of Economic Research

In many of the recent discussions involving labor as a production cost or as an element in price structure, attention has been directed to average hourly earnings rather than to wages per unit of output.[1] The latter, a derived average "piece rate," is, however, a more appropriate measure for the purpose of such discussions; it has the same denominator as the other unit production costs and as the price of the output, with which it is often compared, and it is affected through time in exactly the same way as they are by changes in the quality or composition of the output. Moreover, conclusions based on average hourly earnings are not likely to be consistent with conclusions based on the derived piece rate, for the measures of these two concepts are not concurrent, although they are sometimes even explicitly assumed to be.

The differences in movement between average hourly earnings and wages per unit of output arise from changes in the production content of the man-hour. During the two Post-War decades, the changes in physical output per man-hour, or "productivity," in manufacturing have generally been in an upward direction; and these increases have taken place in periods of low, as well as brisk, production activity. It is outside the scope of this paper to consider the contributions made by the various factors of production to the advances in productivity.[2] What is of primary interest here is the fact that productivity has changed, for this fact provides the statistical explanation of the divergence of average hourly earnings and wages per unit of output.

Wages per unit of output, which will also be called unit labor cost hereafter, may be derived either (1) directly, by division of wages by the corresponding physical output or, (2) sometimes more conveniently, by deflation of average hourly earnings by productivity. Since manufacturing industries typically make a variety of products in un-

* The author is indebted to Dr. Frederick C. Mills for his criticism of the manuscript.

[1] An outstanding exception is Paul H. Douglas, "Effect of Wage Increases upon Employment," *American Economic Review, Supplement* (March 1939), pp. 138–57.

[2] Productivity in the sense of output per man-hour should not be confused with the concept of productivity employed in distribution theory. In the former sense, productivity is merely a useful technical coefficient; it does not, of course, imply that all output is attributable to labor alone.

stable proportions rather than a single homogeneous product, it is usually necessary in practice to deal with index numbers of these concepts. If all the series involved are mutually consistent, then the two methods of derivation yield identical results:

$$\text{Index of unit labor cost} = \frac{\text{Index of wages}}{\text{Index of production}} =$$

$$\frac{\text{Index of man-hours} \times \text{Index of average hourly earnings}}{\text{Index of production}} =$$

$$\frac{\text{Index of average hourly earnings}}{\text{Index of productivity}}.$$

If the series are not mutually consistent (e.g., if the estimates of man-hours entering into the productivity index were not derived by deflation of wages by average hourly earnings), this identity may only be approached.

In Table 1, hourly earnings and unit labor cost are shown for Rayon, a technologically progressive industry for which the National Re-

TABLE 1

RAYON INDUSTRY: HOURLY EARNINGS, LABOR COST, AND PRICE
(1929 = 100)

Year	Hourly earnings*	Labor Cost		Price	
		Hourly earnings ÷ productivity†	Wages‡ ÷ production†	B.L.S.§	Value ÷ production¶
1929	100.0	100.0	100.0	100.0	100.0
1930	97.6	77.4		84.5	
1931	95.7	63.5	65.4	60.2	67.9
1932	94.5	61.1		51.6	
1933	100.5	50.2	45.4	48.1	55.1
1934	119.5	58.1		46.5	
1935	122.1	54.7	50.9	45.6	55.6
1936	126.4	53.7		46.3	
1937	146.8	60.8	51.9	47.1	60.5

* Relatives of figures shown in National Resources Committee's *Structure of the American Economy*, p. 386. Original figures for 1932–37 were supplied by B. L. S.; the 1929 figure was derived from Census prevailing hours and a B. L. S. estimate of percentage of prevailing hours operated; the 1930 and 1931 figures were inserted by straight-line interpolation.

† For indexes of production and productivity (output per man-hour), see H. Magdoff, I. H. Siegel, and M. B. Davis, *Production, Employment, and Productivity in 59 Manufacturieng Industries: 1919–1936*, Part Two, p. 190.

‡ Statistics for wages were obtained from *Census of Manufactures*.

§ As quoted in *Structure of the American Economy*, p. 386, but converted to 1929 base.

¶ Statistics for value of products were obtained from *Census of Manufactures*. For production index, see footnote †.

sources Committee compares hourly earnings and the price of the product in *Structure of the American Economy* (pp. 125, 386). In general, hourly earnings rose sharply between 1929 and 1937 while the Bureau of Labor Statistics price index for rayon declined precipitously. During the same interval, however, productivity more than doubled; according to the National Research Project index for Rayon, the increase was 141 per cent.[3] Division of the series for hourly earnings by this N.R.P. index yields a measure of unit labor cost, which, in contrast to hourly earnings, falls decisively but remains above the B.L.S. price index. The hourly earnings series and the N.R.P. productivity index, however, are not absolutely consistent; the former is correlative with a man-hour index which differs from the one used in the derivation of productivity. A more satisfactory index of unit labor cost is obtained by deflation of relatives of the wages reported for the Census Rayon industry by the corresponding National Research Project index of production.[4] For comparison with this index of unit labor cost, the analogous price measure—viz., the quotient of relatives of the value of products reported by the Census and the N.R.P. production index—is preferable to the B.L.S. price index. Since these new series for unit labor cost and unit value are based on Census data, they are available for odd-numbered years only. From Table 1, it may be seen that the new measure of unit labor cost shows a greater net decline than the old one while the new price measure does not fall to the same extent as the B.L.S. price index. According to the measures, unit labor cost decreased by more than price during the period of interest. Thus, despite the great increases in average hourly earnings, unit labor cost remained flexible; the advances in productivity were not only sufficient to reduce unit labor cost far below the 1929 level but also to reduce it in relation to the price of the product.

In Table 2, indexes of hourly earnings and unit labor cost are shown with other relevant series (base 1929=100) for all manufacturing in the Post-War period (1919–1939). Although the measures are not definitive, they are sufficiently reliable to indicate the essential relations. The index of hourly earnings is based on Bureau of Labor Statistics and National Industrial Conference Board series.[5] Since all the indexes involved are mutually consistent, the measure of unit labor cost may be described as either the quotient of the indexes of wages and production or the quotient of hourly earnings and productivity. The index

[3] H. Magdoff, I. H. Siegel, and M. B. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries: 1919–1936* (W.P.A. National Research Project, Phila., May 1939), Part Two, p. 190.

[4] *Ibid.*

[5] Since hourly earnings were not reported for 1919 by either B. L. S. or N. I. C. B., an estimate was made in the manner described in Table 2, footnote ‡.

TABLE 2

ALL MANUFACTURING: HOURLY EARNINGS, LABOR COST, PRICE, AND OTHER SERIES
(1929 = 100)

Year	Production*	Wages†	Hourly earnings‡	Man-hours§	Output per man-hour¶	Unit labor cost**	Correlative prices††	B. L. S. price index for	
								Finished products	Semi-manufactured goods
1919	69	89	86	103	67	129	128	138	168
1920	70	106	103	104	68	152		159	211
1921	54	68	89	77	71	126	113	109	102
1922	72	74	84	88	81	103		102	105
1923	85	93	92	102	83	110	101	105	126
1924	80	87	95	91	97	109		102	116
1925	88	92	95	96	92	104	101	107	112
1926	91	94	96	98	93	103		106	107
1927	88	93	98	95	93	105	101	101	100
1928	93	94	98	95	97	101		102	101
1929	100	100	100	100	100	100	100	100	100
1930	80	81	100	81	98	102		93	87
1931	66	61	96	64	103	93	88	82	74
1932	53	42	84	50	105	80		74	63
1933	62	45	84	54	114	73	73	75	70
1934	66	58	100	59	112	89		83	78
1935	75	67	103	65	115	90	88	87	78
1936	90	78	104	75	120	86		87	81
1937	97	93	117	79	123	95	92	92	91
1938	75	70	118	60	126	94		87	80
1939	94	82	119	69	136	87		85	82

* The Day-Thomas index for odd-numbered years 1919–37 converted to base 1929 and completed by means of the National Research Project index (1919–36) and the Federal Reserve index (1936–38). The three original series were in fairly close accord in common years.

The Day-Thomas index, which is shown in *Census of Manufactures: 1937*, Part I, p. 17, excludes Manufactured Gas and Railroad Repair Shops; these two industries were not included in the 1937 Census survey. The figures for 1933, 1935, and 1937 include liquors and beverages. The 1919 index is not precisely comparable with the figures for the later years since it includes output of establishments making products valued at $500 or more; the lower limit for 1921 and later years is $5,000.

The National Research Project index is shown in H. Magdoff, I. H. Siegel, and M. B. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries: 1919–1936*, Part One, p. 65. This index, like the Day-Thomas measure, has changing weights.

† Census statistics for odd-numbered years supplemented by B. L. S. annual index. The Census figures exclude Railroad Repair Shops and Manufactured Gas and refer to establishments making products valued at $5,000 or more.

‡ Based on National Industrial Conference Board series for 1920–32 and Bureau of Labor Statistics series for 1932–38. The 1919 figure is the quotient of the relatives for wages and man-hours. The N. I. C. B. series is shown in *Wages, Hours, and Employment in the United States: 1914–1936*.

§ Quotient of indexes of wages and hourly earnings, except in 1919. The estimate for this year was obtained on the assumption that man-hours changed between 1919 and 1920 by the percentage indicated by the B. L. S. employment index for manufacturing.

¶ Quotient of indexes of production and man-hours.

** Quotient of indexes of wages and production or of hourly earnings and productivity. The 1919 figure slightly understates labor cost since the production index for this year includes the output of very small establishments (see footnote *).

†† Quotient of index of value of products reported by Census and index of production. Both indexes exclude Railroad Repair Shops and Manufactured Gas in all years. The 1919 quotient is a

of wages is based on Census totals and the B. L. S. series for factory pay rolls. The index of man-hours is the quotient of this wage measure and the index of hourly earnings.[6] The production series was constructed from the Day-Thomas, National Research Project, and Federal Reserve System indexes for manufacturing. The productivity measure is the quotient of the production and man-hours series. Three price series are presented: the B. L. S. wholesale price indexes for semimanufactured goods and finished products (converted to the base 1929) and the quotient of relatives of the value of manufacturing production and the production index.

The general movement of hourly earnings during the two Post-War decades has been upward. The 1919 relative was 86; the maximum for the first decade, 103, occurred in 1920. Between 1919 and 1932, the index declined from 100 to 84. Then, under the stimulus of governmental action and labor pressure, hourly earnings spurted upward, reaching the previous Post-War maximum of 103 in 1935 and continuing to the unprecedented height of 119 by 1939. During the sharp recession of 1937–38, hourly earnings increased slightly—from 117 to 118.

Unit labor cost, unlike hourly earnings, has a decidedly downward trend. The difference is due to the tremendous increase in productivity.[7] According to our index, productivity more than doubled between 1919 and 1939; it increased steadily in the first decade from 67 to 100, and then, suffering but two minor reversals, continued upward in the second decade to 136.[8] Unit labor cost in 1919 was 129 per cent of the 1929 figure; it reached the Post-War maximum, 152, in 1920. In 1930, unit labor cost resisted decline, but then gave way, falling to 73 per cent of the base level by 1933. Throughout the remainder of the decade, unit labor cost was lower than in 1929 or any preceding Post-War year despite the unparalleled increases in average hourly earnings.[9] Unit labor

---

slight underestimate since the production index for this year includes the output of establishments whose products were valued at $500 (see footnote *); the value series is restricted to establishments reporting output of at least $5,000 in all years.

[6] Man-hours for 1919 were determined in the course of the derivation of the estimate for hourly earnings (see Table 2, footnote §).

[7] For productivity changes in individual industries, see H. Magdoff, I. H. Siegel, and M. B. Davis, *op. cit.*; for changes in unit labor cost in individual industries, see "Employment and Production in Manufacturing Industries, 1919 to 1936," *Monthly Labor Review*, Dec. 1939, pp. 1397–1404.

[8] Our index understates the true rise in productivity since the Day-Thomas series, which forms our production measure for the odd-numbered years 1919–37, has a downward bias. A more satisfactory production index for these (and earlier) census years is being prepared by Dr. Solomon Fabricant of the National Bureau of Economic Research in the course of his study of manufacturing production. This index, which includes a greater number of product series and industry measures and is adjusted to represent all physical output, shows production for 1935 and 1937, for example, at 82.8 and 103.3, respectively, rather than at 75 and 97. The productivity relatives corresponding to Dr. Fabricant's production figures are 128 and 130, instead of 115 and 123.

[9] Since our production index has a downward bias (see footnote 8), the true decline in labor cost after 1929 is underestimated. The more satisfactory production index referred to in the preceding footnote yields relatives of 81 and 90 for 1935 and 1937, instead of 90 and 95.

cost declined only slightly between 1937 and 1938 (from 95 to 94) but continued to fall in 1939 (to 87) despite the recovery of production; hourly earnings, on the other hand, increased slightly in both years.

During the last two decades, according to the B. L. S. indexes, the prices of semimanufactured and finished goods declined to a greater extent than did unit labor cost. In general, the index of unit labor cost is much closer to the price index for finished products than to the series for semimanufactures; in fact, the similarity in several years of the turbulent Thirties is surprising. Closer general agreement is indicated if the two B. L. S. series are replaced by the quotient of aggregate value of output and the production index. This quotient, which could be derived for odd-numbered years only, represents both finished and semifinished goods, is more comprehensive than the two B. L. S. indexes, and refers to the same composite unit of output as is implied in the measure of unit labor cost. In 1919, the index of unit labor cost and the new price measure were on practically the same level—129 and 128, respectively; the latter, however, declined to practically the base level by 1923 while the former fell more gradually. In the odd-numbered years 1931–37, the resemblance was greater than between unit labor cost and the B. L. S. index for finished products; the unit labor cost series, however, was higher in three of the four years.[10]

From the foregoing, it is clear that average hourly earnings and wages per unit of output, the derived average piece rate, do not move in the same manner. The trend of the former during the Post-War period has been upward, while the trend of the latter, like the trend of price, has been downward. In the last few years, while hourly earnings rose to new heights, the index of unit labor cost remained below the 1929 level in reasonable accord with the relatives of price. It seems that changes in productivity tended to render unit labor cost flexible despite the advances in average hourly earnings. In any case, it is evident that conclusions concerning wage rigidity or the magnitude of labor cost which are based on average hourly earnings rather than the derived piece rate may be very misleading.

[10] Although the production index entering into our measures of unit labor cost and unit value of output has a downward bias (see footnote 8), the relation between these two measures is not affected. The more satisfactory production index mentioned in footnote 8 shows that the true figures are lower in later years. For example, the true unit value relatives for 1935 and 1937 are nearer to 80 and 86 than to 88 and 92.

A MEASURE OF PURCHASING POWER INFLATION AND DEFLATION*

By Murray Shields
Economist, Irving Trust Company

During the past few years attention has been drawn to the role of the Federal Government as a contributor to purchasing power, but most discussions of the question fail to give adequate weight to the fact that the concept of the Government's contribution to purchasing power embraces two vitally different processes. First, there is that *activation* of purchasing power which occurs when the Government's contribution takes the form of the transfer of existing purchasing power from idle to active status. Second, there is purchasing power *creation:* that is, the introduction of newly created purchasing power into the income stream.

Some excellent work in the measurement of the Government's contribution has been done by Martin Krost and Lauchlin Currie in an unpublished study, and by Arthur Gayer[1] and others. But the series they have prepared appear to allow for no distinction between, and in effect represent a combination in varying amounts of, the stimuli of purchasing power activation and purchasing power creation. For example, the cash deficit—after exclusion of certain irrelevant items—is perhaps the chief factor in their measure of the Government's contribution to national income. But the stimulative effect of the deficit will depend in no small part on the source of the funds disbursed by the Government. To be sure, the expenditure of funds raised by the sale of securities to private investors may effect a transfer of funds from idle balances to active use, and therefore afford some stimulation. But the activating effects of such a process are not always realized, for if the deficit expenditures by the Government involve the disbursement of funds borrowed from individuals or corporations who would in any event have put the funds to use, the stimulative effects are problematic. On the other hand, when deficit expenditures involve funds raised by the sale of public securities to the banks, the influence on purchasing power is direct and immediate, since wholly new purchasing power is brought into existence.

The measure which is presented here is designed to throw some light on the process of purchasing power creation. It involves no startling discovery, for it represents no more than a refinement and reorganization of figures, with which banking students are familiar, for the purpose of putting them to use in measuring and explaining those changes

* Revision of paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 27, 1939.

[1] Arthur D. Gayer, "Fiscal Policies," *The American Economic Review*, March, 1938.

in purchasing power which perhaps are most clearly described as purchasing power inflation and deflation.

The total amount of purchasing power actually in the hands of individuals, corporations, and all others except the Federal Government is measured by the total of domestic deposits and currency actually in circulation. The existing purchasing power is made more effective if it is used more frequently; i.e., if the rate of its turnover is increased—an increase in turnover being the monetary expression of the activation

CHART I

A MEASURE OF PURCHASING POWER INFLATION AND DEFLATION

process described above. But when the total of domestically-owned deposits and currency in circulation is increased, new purchasing power is brought into existence; somewhere in the economy purchasing power has been added which was not previously withdrawn elsewhere.

There is presented in the solid line in Chart I a measure[2] of purchasing power inflation and deflation. The figures are shown for member bank call report dates for the years 1930–34, and weekly thereafter. For convenience in plotting, the series has been cumulated from January 2, 1935, the first date for which weekly computations are available. The statistical methods used are described only briefly at this point since they are treated in considerable detail in the footnotes to this

[2] I wish to acknowledge the assistance of Miss D. R. Funck in the preparation of the statistics used in this paper.

paper. From the total of demand and time deposits in all member banks, there have been subtracted checks in the process of collection, deposits of the U. S. Government, domestic and foreign interbank balances, and foreign individual deposits.[3] The foreign deposit figures used prior to 1935 are interpolations—based on an unpublished series—between the end of the year figures as reported by the Department of Commerce. From January, 1935, until April 3, 1940, the Treasury weekly figures have been used. And to fill in the figures for the three months period for which no Treasury figures are available, estimates of foreign deposits have been prepared.[4] Foreign individual deposits are included in the demand deposits-adjusted figures as reported, and at times have been one of the chief factors affecting the changes recorded

[3] Following is a description of the series and statistical methods used in computing the Measure of Purchasing Power Inflation and Deflation.

Series for the period 1930 through 1934:

Demand deposits-adjusted, time deposits and foreign bank deposits of all member banks as of call dates—Annual Reports of Federal Reserve Board

Foreign deposits in United States as of the end of each calendar year—The Balance of International Payments of the U. S. Department of Commerce

Foreign bank deposits at Federal Reserve Banks—Federal Reserve Weekly statements—Annual Reports of Federal Reserve Board

Volume of money in circulation as of call or approximate dates—Annual Reports of Federal Reserve Board

Cash in vault of all member banks as of call dates—Annual Reports of Federal Reserve Board

Series for the period 1935 to date:

Demand deposits-adjusted, time deposits and foreign bank deposits of weekly reporting member banks in 101 cities, weekly—Federal Reserve statements, Annual Reports of Federal Reserve Board

Foreign deposits in United States—U. S. Treasury

Foreign bank deposits at Federal Reserve Banks—Federal Reserve statements

Volume of money in circulation, weekly—Federal Reserve statements

Cash in vault of weekly reporting member banks in 101 cities, weekly—Federal Reserve statements.

Methods of computation for period 1930 through 1934: (member bank call report dates) Demand deposits-adjusted; i.e., amount of balances in checking accounts of individuals, partnerships, corporations and state and local government bodies less checks in process of collection, have been added to time deposits, exclusive of interbank balances. Total foreign deposits in the United States have been estimated for the dates for which Department of Commerce data are not available. From these figures have been deducted foreign bank deposits at member banks and Federal Reserve Banks, thus giving a total of foreign private deposits in the United States. The latter series has been deducted from the total of demand deposits-adjusted and time deposits to give a total of domestic deposits in the United States exclusive of United States Government and bank balances.

From the total volume of money in circulation has been deducted the amount of cash in vault in all member banks to give an approximation of money in actual circulation. The Measure of Purchasing Power Inflation and Deflation represents the total of domestic deposits plus money in actual circulation.

Methods of computation for the period 1935 to date: (figures as of Wednesday of each week) Demand deposits-adjusted have been added to time deposits, exclusive of interbank deposits. Foreign bank deposits at reporting member banks and Federal Reserve Banks have been deducted from total foreign deposits in the United States. The resultant figure of foreign private deposits has been deducted from demand deposits-adjusted and time deposits to give domestic deposits in reporting member banks. These figures have been raised to an all-member bank basis.

As in the previous period, cash in vault has been deducted from the total volume of currency in circulation to give an approximation of currency in actual circulation. The addition of the latter and domestic deposits yields the Measure of Purchasing Power Inflation and Deflation.

The series have been cumulated from the beginning of 1935 since that represents the period from which foreign deposits are available on a weekly basis.

[4] Tests demonstrate that the methods used provide estimates which show a reasonably close correlation with the U. S. Treasury series (after adjustment for foreign bank deposits in member banks and for foreign central bank deposits in Federal Reserve Banks).

in the adjusted figures. Foreign deposits therefore must be eliminated from the total deposits series, if changes in domestic deposits are to be measured accurately. Certain adjustments have had to be made in the figures used, and it has been necessary to expand reporting member bank figures to provide estimates of all member bank totals, but the result gives a close approximation of the total of domestically-owned deposits in member banks. To this computed total has been added money in circulation less the vault cash of member banks. Thus there has been evolved a reasonably accurate measure of the changes in bank and circulating money, or changes in the amount of purchasing power available to the community.

Attention should be called at this point to certain inadequacies in the series presented here. Figures on non-member bank deposits are not available with sufficient frequency to make them useful for the purposes of an analysis such as this. Furthermore, a difficult technical problem had to be faced with respect to time deposits in member banks. Since only part of such deposits are savings in the true sense, a considerable portion of the totals as shown in the available figures can only be regarded technically as savings. Therefore, the decision was made to include time deposits of member banks in this analysis. Definitive formulation of a true measure must await the development of a more detailed breakdown of the time deposits figures and more frequent reporting of non-member and savings bank deposits. Until such figures are available only partial series, such as are dealt with here, can be used.

The magnitude of recent fluctuations in this measure of purchasing power inflation and deflation is significant. The deflation of purchasing power—as shown by this measure—amounted to about $3 billions in 1931, $1.5 billions in 1932, and $2 billions in the first half of 1933—or a total of $6.5 billions in the 2½ year period. In the middle of 1933 the tide turned. There followed increases in purchasing power of $3.5 billions in 1934, $4 billions in 1935 and $4 billions again in 1936—as shown by this measure. In 1937 and in the first quarter of 1938 a deflation of purchasing power to the amount of about $2 billions is shown. The process of purchasing power creation was then resumed and in the last three quarters of 1938 the rise—as shown by this measure—was a little less than $3 billions. After a period of three months, when no change of consequence was recorded, another rise began and in the past 15 months newly created purchasing power appears to have been flowing into the economy at a rate of about $5½ billions per year.

Obviously purchasing power inflation and deflation on any such scale as this is certain to have a profound effect on business, and it is not surprising that there has been a reasonably close correlation between

changes in the dollar volume of industrial production[5] shown in the broken line (Chart I) and fluctuations in the measure of purchasing power inflation and deflation. In 1930 and the first half of 1931 business declined sharply for reasons apparently outside the monetary and banking system, for while the volume of purchasing power in the hands of the public did not change materially in this period, the rate of turnover was reduced very greatly.[6] In 1931, 1932, and the first half of 1933 the deflation of purchasing power assumed alarming proportions and the dollar volume of industrial production declined sharply.

The initial recovery of 1933 and 1934 was much more sharp than can be accounted for by changes in the amount of purchasing power, but a reversal in the trend of business was to be expected since there was an abrupt transition from a condition where purchasing power was being sharply deflated to one where purchasing power inflation was a stimulating and accelerating force. In 1935 and 1936 there were sharp advances in both series and it is of no little interest that in 1937 the dollar volume of business reached its peak not far from the time when the transition from large scale purchasing power inflation to moderate purchasing power deflation occurred. It may well be true that the recovery of 1936 and 1937 was so dependent on large-scale purchasing power creation that business collapsed when the stimulant was withdrawn and there occurred a moderate contraction of purchasing power. That this is a valid assumption is suggested by the fact that the dollar volume of industrial production started to rise soon after purchasing power inflation was resumed in 1938. Furthermore, when the process of purchasing power inflation stopped even for only a few months early in 1939 the value of industrial production dropped off. During the remainder of the year, substantial advances were recorded both in the purchasing power figures and in the dollar volume of industrial production, but when the rate of purchasing power creation decreased early in 1940, it was accompanied by a decline in the value of industrial production. The downward trend was reversed only after an acceleration in the rate of purchasing power inflation.

The inflation or deflation of purchasing power is, of course, not the only factor responsible for business fluctuations. But it would be difficult indeed to keep business from advancing when newly created purchasing power is being introduced into the income stream as rapidly

[5] The dollar value of industrial production series is based on the index of industrial production, seasonally adjusted, computed by the Federal Reserve Board and the U. S. Bureau of Labor Statistics index of wholesale prices of commodities other than foods and farm products. The latter series has been rebased on a 1923–25 base, multiplied by the index of industrial production and the product related to the value of industrial production as reported by the U. S. Bureau of Census in 1929.

[6] In the period the turnover of bank deposit figures published by the Federal Reserve Bank of New York showed a decline from 115.6 per cent of the 1919–25 average to 83.1 per cent for leading cities outside New York City.

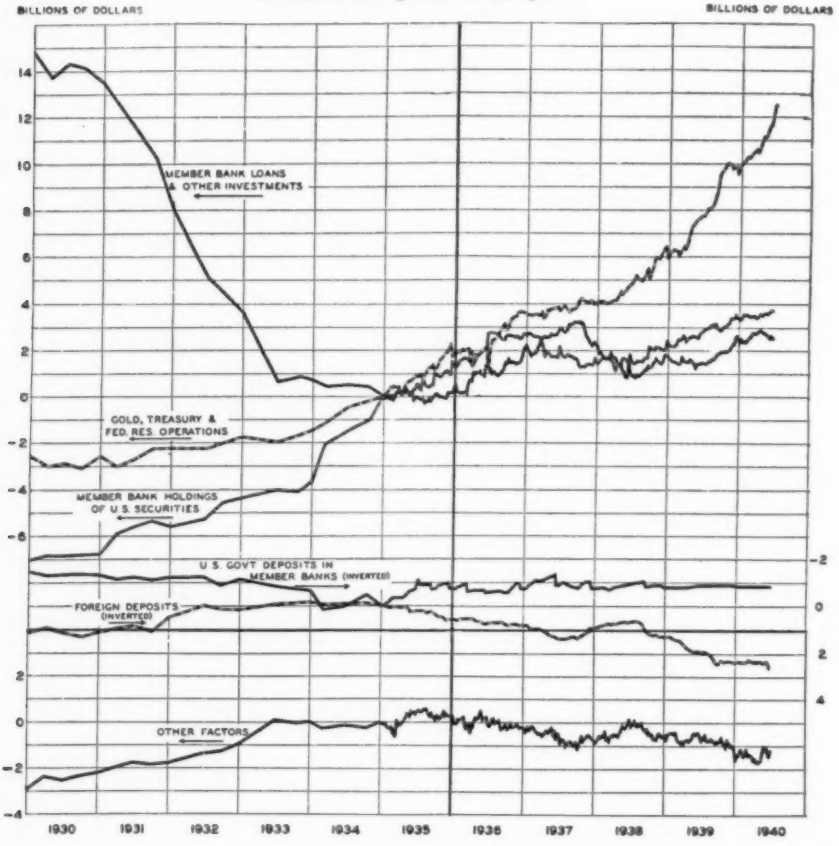
as appears to have been the case during the 1934–36 and 1938–39 periods. In the three-year period 1934–36 purchasing power inflation amounted—according to this measure—to $11.5 billions. This was only

CHART II

FACTORS RESPONSIBLE FOR PURCHASING POWER INFLATION AND DEFLATION

Call Dates, 1930–1934 Weekly 1935 to Date

Cumulative Changes from January 1935



The scale for the inverted curves of U. S. Government deposits and foreign deposits is shown on the right.

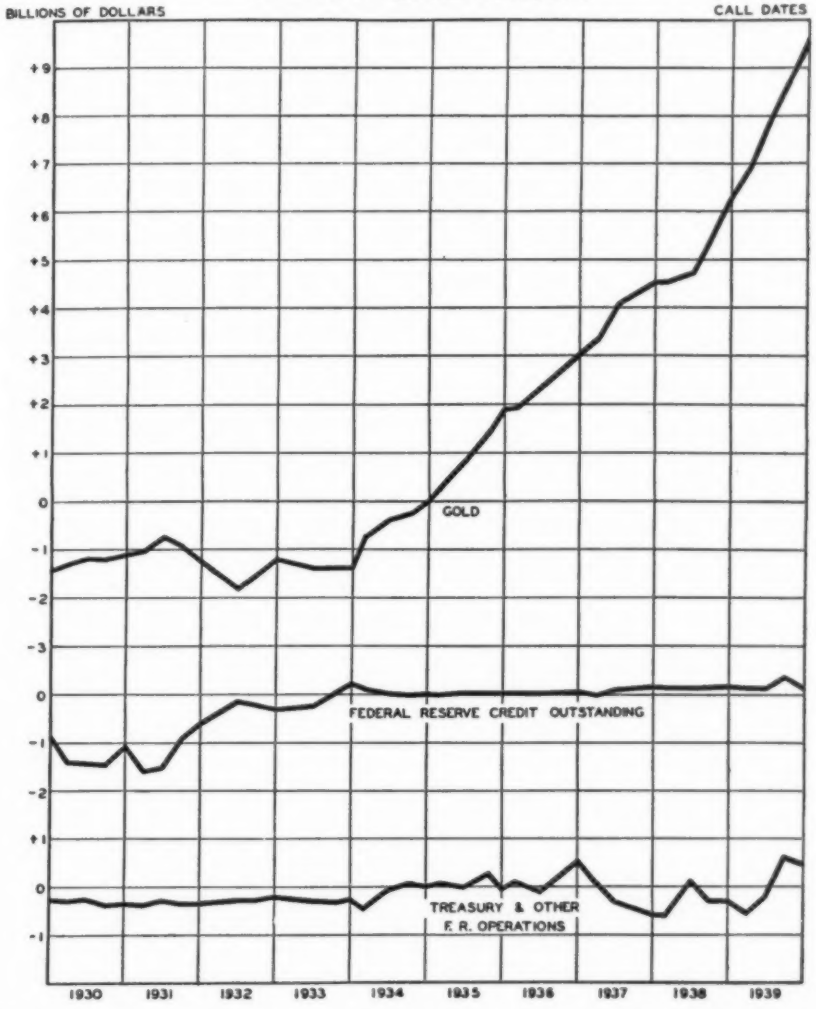
6.7 per cent of the *total* national income paid out during that period but it represented 62 per cent of the *increase* in income paid out.

Chart II deals with the factors responsible for changes in the measure of purchasing power inflation and deflation. Broadly speaking there are three agencies which create new purchasing power—the commercial banks, the Federal Reserve Banks, and the U. S. Treasury. The extent to which gold operations and activities of the Federal Reserve Banks

and the Treasury have been responsible for deposit or currency creation is shown in the broken line in Chart II.[7] When the line rises, de-

CHART III

GOLD, TREASURY AND FEDERAL RESERVE OPERATIONS
Cumulative Changes from January 1935



posits or currency will be correspondingly increased, other conditions remaining the same. The chief factor responsible for the rise in this line since 1934 has been the avalanche of gold imports (Chart III).

[7] Gold, Federal Reserve, and Treasury operations—cumulative changes since January, 1935, in Federal Reserve credit outstanding, monetary gold stock and Treasury currency less changes in Treasury holdings of cash, Treasury deposits at the Federal Reserve Banks, non-member deposits and other Federal Reserve accounts excluding foreign bank deposits.

The influence of commercial bank credit operations on purchasing power is shown in the next two lines. The effect on aggregate purchasing power of changes in member bank holdings of U. S. Government securities[8] is measured in the grey line, and the effect of changes in member bank loans and in their holdings of securities other than those of the U. S. Government is measured in the solid line.[9]

Allowance has also been made for certain other factors. If foreign deposits in commercial banks increase, they can do so only if through the exchange or the security markets there is a transfer of deposits from domestic to foreign holders. Changes in foreign deposits[10] therefore affect domestic deposits inversely and are shown as an independent factor which is inverted in the chart. Occasionally changes in foreign deposits have been a very important factor. For example, in the period September, 1938, through the third quarter of 1939, total bank deposits rose sharply because of additions to our monetary gold stock which accompanied the unprecedented flow of foreign capital to the United States. The bulk of these funds was placed on deposit for the account of foreign holders so that there was little gain in domestic deposits.

Changes in U. S. Government deposits in member banks also are a factor causing fluctuations in the total of domestic bank deposits and currency in circulation. As in the case of foreign deposits, they affect domestic deposits inversely. If the banks make payment for subscription to new Government securities in credit to their War Loan Deposit accounts, the grey line of the chart will rise to reflect the increase in holdings of U. S. Government securities, the inverted U. S. Government deposit line will decline, and there will be no change, other conditions remaining the same, in domestic purchasing power. But when the Government calls for these funds and spends them, the deposits of individuals will tend to rise.

There are, of course, numerous other factors which affect the total of bank deposits and currency in circulation. For example, changes in each of the other asset and liability items on the consolidated statement of all member banks affect the total of deposits. Such factors[11] have been grouped together in the "Other Factors" line.

[8] U. S. Government securities—cumulative changes since January, 1935, in holdings of U. S. Government securities both direct and guaranteed. For the period 1930 through 1934, investments of all member banks as of call dates have been used, and for the period 1935 to date investments of weekly reporting member banks raised to an all member bank basis.

[9] Loans and other securities—cumulative changes since January, 1935, in member bank loans and investments in securities other than those of the U. S. Government. For the period 1930 through 1934, loans and other security investments of all member banks as of call dates have been used and for the period 1935 to date loans and other investments of weekly reporting member banks raised to an all member bank basis.

[10] Total foreign deposits—cumulative changes since January, 1935, in total foreign deposits in the U. S. For the period 1930 through 1934, year-end data are based on figures published in the Balance of Payments of the United States by the Department of Commerce with interpolations based on an unpublished series.

From this chart it is possible to measure the relative influence of the factors responsible for the violent deflation of purchasing power from 1931 to 1933 and the even more violent inflation of purchasing power subsequently. It is clear that the factor responsible for the deflation in 1930–31 was a reduction in bank loans and bank holdings of other securities, and that the inflation of purchasing power in 1934 was occasioned largely by an increase of $4 billions in bank holdings of U. S. Government securities.

In 1935 and 1936 the increase in purchasing power of about $8 billions was the result of an increase in monetary gold stock and other Federal Reserve and Treasury operations of $3.6 billions, an increase in member bank holdings of U. S. Government securities of $2.7 billions, and an increase of member bank loans and investments in other than U. S. Government securities of $2.2 billions. A rise in foreign deposits was about offset by a decline in U. S. Government deposits.

The deflation of purchasing power of about $2 billions in 1937 and the first quarter of 1938 occurred because declines in member bank loans and investments more than offset the moderate increase for which gold, Treasury and Federal Reserve operations were responsible.

The spectacular rise of approximately $9½ billions in the measure of purchasing power since the first quarter of 1938 has been the result of an increase of about $8½ billions in the line measuring the effect of gold, Federal Reserve and Treasury operations which has been only partially offset by an increase of $2 billions in foreign deposits. Member bank investment in United States Government securities has contributed about $2½ billions of new purchasing power and member bank investment in other securities and loans has added about $1 billion of purchasing power.

This chart calls attention to the fact that, in the period from January, 1935, to December of 1939, the purchase of United States Government securities by the banks has been a much less important factor in purchasing power inflation than has the increase in the monetary gold stock, and this is true even if allowance is made for the $2.6 billions of gold imports which increased foreign rather than domestic deposits.

This analysis raises certain questions of a practical nature. In the first place, it suggests that the economy has been, during the past few years, far more dependent than is desirable on large scale inflation of purchasing power. Since business has been able to rise only when newly created purchasing power has been introduced into the income stream at a rate of from $3 to $4 billions per year, and since business has de-

[11] Among the factors included in this item are: changes in commercial bank deposits which occur when savings bank deposits with member banks are increased, and changes which occur when there is a shift of deposits to or from non-member banks.

clined when the stimulant has been withdrawn, the economy gives an appearance of being fundamentally weak. If forces as powerful as those shown here have been necessary to obtain even the moderate recoveries we have experienced, is it not possible that many other policies have actually been deflationary in their influence? Perhaps those students, who have asserted that tax, labor and security market policies are powerful deflationary forces obstructing the return to prosperity, deserve a more receptive hearing than they have received.

In the second place, this analysis suggests that the stimulating effects of a Federal deficit can be and probably have been overemphasized. The deficit during the past few years has involved a combination of two forces: first, that part of the purchasing power inflation for which bank purchases of U. S. Government securities have been responsible, and second, an activation factor which may result when funds are transferred from idle to active accounts. It is clear, however, that the chief force making for the inflation of purchasing power in recent years was gold imports—not financing the deficit through bank credit expansion.

Finally, this analysis provides a basis for making an assumption as to the possible *economic* effects of the European war. If, in order to finance wartime purchases in our markets, European nations use the gold they have under earmark here, the funds they have on deposit in the Federal Reserve Banks, and additional gold which can be sent to us from stocks, or from new production, the top line in Chart II will continue to rise sharply. Furthermore, if the banks purchase part of the securities which the Treasury will probably have to issue in order to finance an expanded armament program, the second line on the chart will continue to rise; if, as business becomes more active and bank loans rise, the third line on our chart will also continue to advance, and if the belligerent governments use their own and their citizens' deposits in our banks to finance the purchase of goods in the United States, foreign deposits will be reduced and domestic deposits will be correspondingly increased. The point is that a prolonged and active war in Europe may well involve an injection of new purchasing power into the economy of the United States approximating in magnitude that of the past few years and so large that, for a time at least, business could scarcely fail to be stimulated.

With respect to the longer future there is, of course, much less cause for optimism, for apparently our economy is so constricted by internal deflationary influences that it cannot rise except when one of the most powerful economic stimulants we know is being applied in potentially dangerous doses.

FACTORS TO BE CONSIDERED IN MEASURING INTERCITY AND INTERREGIONAL DIFFERENCES IN LIVING COSTS

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Measurements of intercity differences in living costs may serve four distinct purposes: They certainly are a fruitful and interesting source of academic discussion; they serve to guide persons contemplating a change of domicile and wishing to calculate the purchasing power of income in two different cities; they may be an important factor in wage determination, not only for the government administration enforcing a minimum wage law, but for associations of employers and employees negotiating wages over any area in which living costs appear to differ, and desiring to determine wages which will provide equivalent well-being in the different cities of the area; and they may become a factor in adjusting grants within governmental units, as state grants to counties, or Federal grants to states.

It is perhaps hardly necessary to say that this discussion is not concerned with differences in standards of living among cities, or differences in planes of living. Differences in standards of living, that is, differences in the manner of living considered normal and proper by the families in any two communities, are a function of differences in custom, education, and in income, while differences in the plane of living actually found in certain communities may result either from differences in income, or in standard of living, or both.

We might define our task as that of measuring the income necessary to provide equivalent satisfactions, if satisfactions were not influenced by and made up of so many psychological factors not readily susceptible of measurement; if one could disentangle actual preference from compromise with circumstance. Since that is impossible, we are forced to seek budgets of goods and services which will provide equivalent real incomes under different conditions. Even though we are forced, by the elementary state of the science of psychology, to use this sort of measure, we should be less than scientific if we did not admit that given goods and services provide different degrees of satisfaction in different circumstances. There are many communities in the United States where the young men go to the movies on Saturday night in corduroy trousers and coarse blue cotton shirts with girls wearing the simplest of cotton prints, and it is impossible to measure the difference between their enjoyment of their clothes and the movie, and that of persons in other communities where tailored suits, broadcloth shirts, and rayon prints are the custom. When such differences in consumption habits

have been analyzed, however, it has been found, in all the studies of which I know, that at least part of the apparent difference in taste was a difference in income.

Figures recently made available by the Study of Consumer Purchases, for example, show the tendency for family expenditures in communities of different size and in all regions to advance (in similar fashion) as income increases. For example, the data collected in this study on average clothing expenditures per family in New York and Chicago, six cities of about 250,000 population, 14 cities of from 30,000 to 75,000 population, and 29 small cities show a striking similarity in the average amounts spent per family by families with incomes above $2,000. Regional differences in consumers' preferences due to variations in the climate, the racial composition of the population, and to population density persist and remain of considerable importance, but many of the differences in taste which once characterized certain parts of the country are disappearing. The spread of the radio, the automobile, the motion picture and the nation-wide periodicals has eliminated a large part of those deviations in consumption patterns which once occurred because some parts of the Nation did not know what the other parts were doing. We have, therefore, some justification besides the backward state of the science of psychology for measuring differences in the cost of the same level of well-being in terms of differences in the costs of equivalent goods and services.

In undertaking a study of differences in living costs between two cities the most important factors to be considered seem to me to be as follows:

1. The distribution of families according to size and income in the two cities, in order to estimate at what levels of living a comparison of costs will be more fruitful.

2. Differences in consumption habits which may be due to differences in the historical background of the two cities, to climate and economic resources, to the kinds of goods available, and to differences in comparative prices.

3. The availability of some method of determining goods of equivalent quality in the two cities.

4. A formula for measuring differences in costs which will seem reasonable to the layman as well as to the scientist.

With the enactment in 1938 of Federal minimum wage legislation which directs the Wage and Hour Administration to consider as one of the factors bearing on regional differences in wage rates competitive conditions as affected by differences in living costs, it has become even more urgent than it has been heretofore to find satisfactory answers to the technical questions which are inevitably raised when one attempts to measure intercity or interregional differences in living costs.

The problems and possibilities of statistical measurements of this sort were called to the attention of the general public in the United States in 1929 when the Twentieth Century Fund financed an inquiry by the International Labour Office into the relative costs of living in Detroit and 14 European cities.[1]

This survey compared living costs for minimum wage employees of the Ford Motor Company in Detroit with those in 14 European cities. Prices were supplied by statistical agencies in the countries concerned and were summarized by the formula generally known in this country as "Fisher's ideal index":

$$\sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \cdot \frac{\sum p_1 q_1}{\sum p_0 q_1}}.$$

In each case p_0 refers to Detroit prices, and q_0 to quantities of goods actually consumed by wage earners in Detroit, while p_1 and q_1 apply to the prices and the customary consumption of wage earners and clerical workers in the other 14 cities in succession. The complexity of the task is illustrated by the fact that the cities covered ranged from Helsinki to Barcelona and Istanbul.

The formula given above was most literally applied in the case of foodstuffs. Even in the case of food, however, certain adjustments were made. For example, the Statistisches Reichsamt found a food-cost index for Berlin, using Detroit costs as 100 and using Detroit consumption for weighting of 82.3; but 67.6 using German workers' consumption for weighting.

These ratios provide a geometric average of 75.8. While admitting the idea that differences in the habits of consumption must be taken into account in computing the relative cost of food in Germany and Detroit, the German statistical authorities doubted the adequacy of the formula used by the International Labour Office. Therefore they suggested a method of their own.

> It consists mainly in finding the cost in Germany of the American quantities of the 29 articles used by the International Labour Office (accounting for 70.9 per cent of the total food expenditure in Detroit). In some cases, however, articles of current German consumption have been substituted for American articles ordinarily not consumed in Germany, the quantity of the German article thus introduced being so calculated as to represent the same caloric value as its American "equivalent."[2]

The result of this calculation provided a new food-cost index for Berlin (again using Detroit as base) of 71.6. This procedure seems strange at the present time when we are all more or less familiar with

[1] International Labour Office. *An International Enquiry into Costs of Living*. Studies and Reports: Series N. (Statistics. No. 17) Geneva, 1931.

[2] *Op. cit.*, p. 34.

the fact that calories are cheaper than any other aspect of the diet. An American scientific agency attempting such substitutions would take account of proteins, minerals, and vitamins as well as calories.

The subject of housing was even more difficult than that of food. The type of housing which predominated among families of minimum wage employees of the Ford Motor Company in 1930 was

> a detached house occupied exclusively by the family, and equipped with electricity, gas, central heating and a bathroom. In most of the European towns included in this enquiry, houses of such a type rarely exist. . . . In these circumstances, . . . it was decided that as far as possible two figures for rent should be supplied. The first, called the "lower limit", was to refer to a dwelling as it was actually occupied by the working classes in the respective towns. This house or flat was to have four to five rooms, and if working men generally do not occupy dwellings of this size the rent was to refer to a house situated in a working class district, and of the same quality (according to local standards) as the smaller dwellings usually occupied by qualified working men. The second figure, called the "upper limit", was to refer to an apartment or house which should be identical as far as possible in every detail with the American type of dwelling.
>
> It will be seen that these two figures imply a different interpretation of what may be considered to be an equivalent dwelling. In the case of the "lower limit" the theory underlying the choice is that the number of rooms occupied by a family of given size must be considered as an expression of its standard of living, whereas the details of the equipment depend mainly on habits and tastes. In this interpretation, the presence or absence of a bathroom, for instance, is regarded as being a matter of custom. An interesting confirmation of this assumption is to be found (e.g.) in the report prepared by the Belgian Ministry of Labour on the actual housing accommodation of Antwerp workers . . . where it is stated that Belgian workers would not be prepared to spend any extra money for the advantage of possessing a bathroom in their homes. This situation applies probably to many other cities, and workers, if they were allowed some extra income for the purpose of having dwellings equipped with bathrooms, would not occupy such dwellings, but would prefer to spend these sums in a different way.[3]
>
> The theory underlying the "upper limit" is evidently quite different. Equivalence is interpreted as identity in this case, and the assumption is that a bathroom will always yield the same amount of satisfaction, whether it is a usual part of the equipment of the working class house or not. The consequence is that the rents obtained for the "upper limit" generally do not refer to dwellings as usually occupied by working men in the respective towns, but that the buildings are mostly inhabited by families of a somewhat higher social class.[4]

In the effort to secure uniformity of quality in the clothing priced, actual samples of the clothing worn by Detroit families in 1929 and 1930 were circulated to each city covered by the study and price quotations

[3] The report does not make clear whether the Belgian Ministry of Labor was making this statement on the assumption that Belgian wage earners would not have wanted bathrooms no matter what their money incomes, or whether it was assuming that with incomes slightly larger than the incomes of the time, other needs were more urgent.

[4] *Op. cit.*, pp. 17–19.

on garments of similar quality were obtained from representative shops.

> In some cases, however, no article similar to the sample could be found in the European shops, and hence no quotation for that particular item could be obtained; in others, recourse had to be had to prices relating to articles of clothing corresponding in use to the American samples; in all cases, considerable difficulty was met, especially for women's and children's clothes, in obtaining prices based on the quality of the sample, without giving too much weight to the cut, which was frequently different from that of usual European clothes. Furthermore, in many European countries children's clothes are usually made at home, and hence the prices obtained for ready-made children's wear were often too high and quite out of harmony with the prices of adults' apparel.[5]

The difficulty of securing prices for equivalent articles of clothing was most extreme in Istanbul where women's clothing is markedly different from the kinds of clothing worn by women in Detroit.

As regards fuel and light costs, since statistics of mean temperature "seemed to indicate" that the climate of Detroit is colder than the European cities, and very much colder than cities such as Barcelona and Marseilles, in the majority of cases, the actual expenditures for fuel and light usual in European towns were treated as cost.

Medical costs were computed on the basis of the cost of $6\frac{1}{3}$ house calls by a physician during the year, $9\frac{1}{2}$ visits to a physician or surgeon, and 10 visits to the dentist for an extraction or ordinary filling.

The miscellaneous group was handled by pricing all those miscellaneous items for which it seemed possible to obtain definite unit prices, (e.g. week-day paper, Sunday paper, tobacco and cigarettes, postage, telephone calls, cinema visits, hair cuts, daily transport, laundry charges, certain linen and household furnishings, etc.) and then obtaining a price ratio between Detroit and the European town by the use of Detroit quantities.

It thus seems clear that the complexities of the problem actually prevented the International Labour Office from pricing goods and services representing equivalent well-being in all the cities which it covered, and that the results which it obtained in this study were very much influenced by the customary living conditions of wage earners in each city. In the period between 1929 and 1934, Dr. Staehle and Dr. Guye, members of the Statistical Section of the International Labour Office, made important theoretical contributions to measurements in this field, especially as regards food and housing costs, but the International Labour Office has not undertaken any extensive new survey of living costs.[6] Its monthly index of food costs is now computed with fixed weights.

[5] *Op. cit.*, pp. 20–21.

[6] International Labour Office. *International Comparisons of Cost of Living.* A study of certain problems connected with making index numbers of food costs and of rents. Studies and Reports. Series N. No. 20.

On the assumption that consumption habits are relatively homogeneous in large cities throughout the United States, the method generally used to determine differences in living costs as between cities in this country has been that of pricing in a number of cities a fixed quantity budget, with certain adjustments in the fuel allowances for differences in the amount of artificial heat required in given climatic zones.

This is the method used by the National Industrial Conference Board in its several studies in this field. The Board states in reporting on "Local Variations in the Cost of Living" that a uniform budget was used for all 74 cities, except insofar as climatic or peculiar local housing conditions dictated variations.

Here again housing costs present the most serious problem:

> Housing accommodations differ widely not only among cities but within cities. It has been impossible, therefore, to devise a practical measurement that will indicate accurately the differences in the rents of living quarters, but will not at the same time reflect differences in standards. All that can be done in a study of this character, therefore, is to adopt certain specifications, and to attempt to price in each locality accommodations that are as close to this norm as possible. Hence, the results do not show the differences in the cost of identical types of dwellings, but the approximate difference in the rent of the types of dwelling usually inhabited by wage earners in the localities surveyed.
>
> The common characteristics of the dwellings covered in this survey are that they have a bath, that they do not have less than four rooms or more than six rooms, and that they are of the type inhabited by wage earners.

As regards clothing:

> Merchants were asked to quote minimum prices on a fair grade of inexpensive merchandise. Even with this qualification, however, there may be variations in quality. The difference in price therefore may be differences in price per se, or in quality, or both, but it is impossible to take such differences into consideration.

The Works Progress Administration's investigation of living costs in 59 cities in March 1935 priced two budgets, one at a "maintenance level" for an unskilled worker, his wife, and two children; the other for the same family on an "emergency" basis. Identical budgets were used throughout the country, except the fuel and ice allowances were varied with the climate, and the transportation allowances with the transportation situation in each city. For the purposes of this study the United States was divided into four climatic zones and the amount of heat required for the comfort of a family of father, mother and two children was defined in thermal units. The cost of this heat requirement was calculated for each city in terms of its customary fuel.

In securing rents, the field workers were directed to secure rents for dwellings with a private bath with tub or shower, 4 or 5 rooms, and electricity for lighting. The directions state:

> Under any circumstances, the house must be safely constructed and in at least a fair state of repair, clean, sanitary, free from dampness and without serious fire hazards. Where there is a state or local housing code setting minimum standards for such essentials as light and air, sanitation, etc., and where there is a building code setting standards for structural safety, compliance with these regulations is essential. There must be running water and provision for sanitary disposal of waste. Each room should have natural light and ventilation, with at least one window of normal size opening directly outdoors so as to admit light and air.[7]

This investigation had the advantage of the use of the specifications prepared by the Retail Price Division of the Bureau of Labor Statistics in connection with the periodic collection of prices for the Bureau's cost of living index. These accurate descriptions in terms of all the quantitative measurements that are generally available to the administrative staffs of retail stores greatly improved likelihood that goods of equivalent quality were priced in each city included in the study.

The report on the March 1935 study included for each city surveyed the cost of two different budgets. The first was called a basic maintenance budget which represents "normal or average minimum requirements for industrial, service, and other manual workers;—(It) provides not only for physical needs, but also gives some consideration to psychological values." The second was an emergency budget which "takes into account certain economies which may be made under depression conditions." The "emergency budget" allows more exclusively, though not entirely, for material wants, but it might be questioned on the grounds of health hazards if families had to live at this level for a considerable period of time.

The cost of the "maintenance budget" in the 59 cities included in this investigation averaged $1,261 in March 1935, and that of the "emergency budget" $903.

One of the striking results of this study, perhaps the most striking result, is the extent of the variations in living costs between cities in the same region. In the State of Ohio, for example, the cost of the maintenance budget varied from $1,178 in Columbus to $1,348 in Cleveland, a difference of almost 15 per cent. In this instance, the higher cost occurred in the larger city, but this was not always the case. In the West North Central region the cost of this budget amounted to $1,131 in Wichita, a city of 111,000; and $1,291 in Sioux Falls, a city of 33,000, a difference of 14 per cent.

From the theoretical standpoint, one of the most interesting findings of the investigation is the similarity between the regional differentials in cost of living as shown by the maintenance and the emergency budg-

[7] Works Progress Administration Division of Social Research, "Quantity Budgets for Basic Maintenance and Emergency Standards of Living." Series I. No. 21, p. 28.

ets. Part of the similarity in the differentials is due to the categories included in the emergency budget which have a fixed relation to the cost of that group of items as specified in the maintenance budget. As shown by the following table, similarity in the regional differentials remains, however, when these fixed categories are subtracted and only those which were computed separately for the two budgets are examined.

Index numbers of living costs by regions[1]

Region	Maintenance budget	Emergency budget
New England	105.6	104.8
Middle Atlantic	101.2	100.6
East North Central	100.7	100.1
West North Central	100.1	100.9
South Atlantic	100.0	99.5
East South Central	94.5	94.6
West South Central	94.5	94.8
Mountain	102.5	103.3
Pacific	100.9	101.4
All regions	100.0	100.0

[1] Based on cost of food, clothing, personal care, fuel, electricity, and newspapers; that is, subtracting all those items in which allowances in the Emergency Budget were calculated on the basis of a fixed per cent of the costs computed for the Maintenance Budget. The items included in the calculations on which the above figures are based represent about 60 per cent of the cost of each budget.

We have no way of knowing how far up the economic scale this resemblance would persist, but it is of some interest to find that the results obtained should be so similar at economic levels as widely separated as these. (The average cost of the Maintenance Budget is 39 per cent greater than that of the Emergency Budget.)

The Bureau of Labor Statistics' Study of comparative living costs in 10 small cities, North and South, provides two types of comparisons, one based upon the average cost of the goods customarily purchased by wage earners in small cities in the Northeast, the other based upon the average cost of the goods customarily purchased by wage earners in the Southeast.[8]

Insofar as present marketing methods permit, goods of identical quality were priced in all 10 cities. Living costs in each of the 10 cities were computed according to the formula given above with two vital modifications as regards fuel and housing. Differences in heat requirements due to differences in climate and in custom as regards temperature of dwellings were allowed for in each phase of the formula, that is, fuel costs were computed by calculating $\sum p_1q_1/\sum p_0q_0$. Wage earners in

[8] The budgets used were based upon data from the Study of Consumer Purchases. Average purchases of wage earners in 9 New England and East North Central small cities were derived from the survey made by the U. S. Bureau of Labor Statistics. Average purchases of wage earners in the 4 South Eastern small cities were supplied by the U. S. Bureau of Home Economics.

small southern cities covered in the Consumer Purchases Study purchased fuel providing only about half as many thermal units as that purchased by the wage earners covered in the investigation in the North. This represents, in part, at least a very real difference in needs and it was allowed for in making each cost comparison. In other words, when the southern budget was priced in the North, quantities of fuel providing the heat to which the northern wage earners are accustomed were substituted for the southern quantities; when the northern budget was priced in the South, quantities of fuel providing the heat to which the southern wage earners are accustomed were substituted for the northern quantities. The amount of difference between costs in these 10 northern and the southern cities, as shown by this study, is thus greater than it would have been if allowance had not been made for climatic differences in fuel needs.

Allowances were also introduced as regards climate requirements for housing, as no attempt was made to secure houses of equivalent construction in each of the 10 cities, and central heat was not treated as an essential. The rent comparisons were made by means of two series of standardized averages, the first weighted according to the types of dwellings found in all 5 northern cities combined, the second weighted according to the types of dwellings found in all 5 southern cities combined.

In order to make possible intercity comparisons based upon rents of houses of approximately the same quality (in other respects), costs were calculated on the basis of houses of the same age, with the same number of rooms, and possessing the same number of facilities. The final indexes of the cost of rents were obtained from two groups of dwellings; houses without garage included in rent, and houses with garage included in rent.[9] Within these two groups, dwellings were sorted by number of rooms; then by age, separating those built before 1900, from 1900 to 1920, and after 1920; and finally by their possession of the appropriate number—0, 1, 2, 3, or 4—of the following facilities: Running hot water; bathroom; gas or electricity for cooking; and central furnace, or gas heaters (in the South). Since construction of house was not one of the variables held constant this procedure had the effect of comparing houses with less expensive construction in the South with more expensive houses in the North. These successive sorts gave 90 possible groups in each city. Average rents were calculated for each group, and average rents for each city were calculated by weighting the group averages represented in that city. The weights used were as follows: For the rent indexes for the types of dwellings customarily occupied by northern wage earners, the weights represented the relative importance of each group in the five cities covered in the North in the present survey. For the rent indexes for the types of dwellings customarily

[9] Apartments with heat or heating of water included in rent occurred infrequently. About 10 per cent of the dwellings priced in the North and a few priced in the South were rented on this basis. They were omitted from the analysis because of the difficulty of making the adjustments in the fuel allowances which would have been necessary if they had been included.

occupied by southern wage earners, the weights used represented the relative importance of each group in the five cities in the South.[10] The indexes thus obtained were applied to the average housing expense of northern and southern wage earners, as shown by the Consumer Purchases Study.

The classification used by no means exhausts those factors which exert an effect upon rent, as, for example, square feet of floor space, and character of the neighborhood in which the unit is located, but it was not practicable in the present survey[11] to take into account all these factors.

Rent differences between cities in the same region persisted for all types of houses compared. Thus, in the South, Sumter had higher rents for almost every type of house than did the other four cities covered in the South; and similarly in the North, Holland was the lowest-rent town for virtually every dwelling group.[12]

Since the report on this study was published, I have been informed by Dr. Richard Sterner of the Swedish Social Board, that a similar method has been used in Sweden in securing standardized averages to use in comparing rents from one part of that country to another.

The results obtained by this method are theoretically much more satisfactory than those obtained by using a uniform budget in each city. They give us the advantage of knowing the difference between the cost in each city of the goods which are customarily purchased in the South, and of the goods which are customarily purchased in the North, as well as the difference based on the average of these two measures. The differences between the cost indexes based on consumption in the two areas are very informing to the economist interested in differences in costs in given areas as they are affected by the adaptations in the past of consumption habits to production, and of production to consumption habits. This investigation also showed wide variation in costs between cities in the same region, and in this case, size of city has been controlled. The figures resulting from this study cannot, of course, be taken to represent a general comparison of costs, North and South, or even in small cities North and South, as the number of communities covered was so small.

None of the methods used so far, however, really meets the problem. We want to determine the income which would provide equivalent well-being in different situations. Obviously we need to take account of

[10] The weights were based on data from the rent survey made when prices were collected in the 10 cities, rather than from the Consumer Purchases Study, since age data were not collected in the latter study. The rent survey, being based on more than 1,000 dwelling units in each of the regions, furnished as reliable a basis as the Consumer Purchases Study for this purpose.

[11] For a somewhat similar procedure employed for the analysis of international differences in rental costs see: International Labour Office (Geneva), International Comparisons of Cost of Living, Part II—International Comparison of Rents, by R. Guye. Studies and Reports of the International Labour Office. Series N. No. 20, 1934.

[12] U. S. Bureau of Labor Statistics, "Differences in Living Costs in Northern and Southern Cities," pp. 11 and 12.

differences in climate which may require differences in the provision for housing, clothing, fuel, and refrigeration, but we must have a more precise technique than that used in the International Labour Office investigation of 1929. As the passages I have quoted show, differences in the consumption habits of wage earners' families in the different cities, which were at least in part due to differences in income, were allowed to influence the cost estimates produced in that study.

In taking account of regional differences in historical development and in natural resources which in turn have produced differences in consumption habits, we cannot afford to lose sight of the fact that the goal we have set for ourselves is a determination of the cost of the goods and services required to produce equivalent economic well-being.

It seems to me that it may be possible to prepare comparable but not identical quantity budgets which will provide equivalent economic well-being in the cities to be compared and which will take account of differences in climate, in local products, and in consumption habits. When we measure differences in living costs in different regions, by pricing an identical budget in each community studied, or by securing the average cost of the goods customarily purchased by families of wage earners in the first region in both regions, and of goods customarily purchased by families of wage earners in the second region in both regions, we have only first and second approximations to the answer we need. We have in each case based our answer on comparisons of the cost of identical goods.

If we could go on after our second approximation, we might turn to figures on actual family expenditures and take the goods and services actually purchased by families of the same composition and the same *estimated real income* as a basis for computing the equivalent budgets we need. Using the average difference obtained in our study of 10 small cities, North and South (3.1 per cent), we might take the goods and services actually purchased by families in small northern cities with incomes of $1,400, and by families in small southern cities with incomes of $1,357, and subject them to the very few objective tests of equivalent economic well-being which are now available.

We could, for example, arrive at two food budgets identical in protein, mineral, and vitamin content, and still in accordance with the food habits of the two regions, by computing the nutritive content of the foods actually consumed and making the adjustments which would be necessary to bring the two budgets to the same nutritive level. In order that any additions needed in either food budget might be made by means of an objective criterion, any deficiency would be supplied from the cheapest foods rich in the nutrient of which there was a de-

ficiency, which were eaten by more than half the families in the region concerned.

The equivalent budgets would provide for the same number of rooms per person, the same sanitary and lighting facilities, but not for the same house construction or the same type of heating. The type of house construction, heating and clothing found among the families with equivalent real incomes according to our second approximation would be accepted as equivalent.

The medical services provided by the two budgets would be identical, but the estimate of medicines required would be based on the customary purchases of families with real incomes estimated as equivalent in each region.

The "miscellaneous" budgets would also represent average customary purchases on the assumption that our approximation to an equivalent real income would be close enough to make it possible for us to follow tastes as we found them, for such items as recreation, transportation, and personal care. We do not have a scientific basis for judging adequacy in purchases of this sort. In such matters an error in equivalence would not have the same sort of social consequence as would differences in adequacy of diet, in sanitation, medical care or in crowding in housing, the allowances for which would be tested in each region by objective criteria. Such a comparison of costs would to some extent be vitiated if we found that there was a significant difference in preferences for future as against present goods in one city as compared to the other. The more thrifty city group would be treated as living in a less expensive city. In comparisons based on data from white families within the United States at a given time such an average difference in thriftiness is not apt to occur, as between cities.[13]

In view of the fact that there are practical administrative problems which require for their solution some statement of differences in the cost of equivalent well-being as between cities where consumption habits and climate are distinctly different, presumably we shall keep at work on the question of techniques in this field until we find some third approximation which will be more satisfactory than any which have yet been tried.

[13] There appeared to be a significant difference between the savings of the whites and Negroes at the same income levels in the same cities in 1934–36. The difference was caused in part by the great pressure on Negroes to buy life insurance, and in part apparently by the fact that any given income level among the whites was more apt to include a number of families whose incomes had been higher in past years and who had more credit to draw on and more savings than were available to the Negroes.

THE WISCONSIN COMMITTEE ON STATISTICS*

By E. W. Morehouse[1]
Trustees of Associated Gas and Electric Corporation

Preceding discussion of problems of state statistics seems to have established general agreement with two statements. First, progress in state statistics has generally been haphazard and spasmodic, aided in some directions by federal cooperation. Second, the need is felt for greater coordination and cooperation among state statisticians which, until recently, has not been the subject of concerted efforts. Reference has been made to the Wisconsin Committee on Statistics as an illustration of such concerted efforts to stem the tide of individualism in state statistics. It seems appropriate, therefore, to report on the activities of this Committee in the hope of starting discussion which may illuminate both the promise and the limitations of such concerted efforts.

The Wisconsin Committee on Statistics was formed in March 1938 following a proposal which was drafted by a group of statisticians in the various state departments and submitted to, and approved by, the Executive Council, which was composed of the Governor, six legislators and six citizens, and designated administrative officials. This Council was abolished in the last session of the Legislature. This proposal in turn germinated as a result of a voluntary citizen-government committee which earlier made recommendations for simplifying certain accident and unemployment compensation reports. As a matter of administrative form the Committee on Statistics was designated as a subcommittee of the Executive Council. It was composed of the chief statisticians of the principal state departments carrying on a considerable volume of statistical work. These included: Industrial Commission, Department of Agriculture and Markets, Department of Commerce (now abolished), Tax Commission, Public Service Commission, Board of Health, Conservation Commission, Banking Commission, Public Welfare Department and Board of Control (now merged), State Planning Board, and a representative of the State University. These members of the Committee served without extra compensation though Committee work added to their regular activities. The Committee had no direct or explicit statutory sanction; its powers were derived from those of the Executive Council and hence was a voluntary, almost extra-legal agency. Soon after organizing, the Committee secured a full-time, paid secretary from the staff of the Legislative Reference Library, who was employed specifically for this purpose.

* Revision of a paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 28, 1939.

[1] Formerly Chief, Rates and Research Department, Public Service Commission of Wisconsin.

The principal aims of the Committee may be briefly summarized as follows:

1. Coordination of statistical work of the several departments to minimize overlapping and duplication.
2. Simplification of reporting forms and reduction of costs of reporting imposed on the general public.
3. Improvement of state statistics with special reference to (a) selection and training of personnel, (b) extension of mechanical tabulation where economically advisable, (c) reduction of printing costs, (d) improvements of statistical presentation, (e) review of statistical inquiries and report forms to eliminate duplication, and to avoid ambiguities and the gathering of needless statistics, and (f) review of completed work and survey of coverage of statistical data to disclose gaps in needed information.
4. Preparation of a central index of statistical information for the more efficient and economical handling of state statistics.

One of my colleagues summarizes the aims of the Committee as "*an adventure in self-discipline.*"

Each one of these principal aims might well form the subject of a separate paper, but brief comments upon only a few of them will be given. In formulating these aims consideration was given to the establishment of a general state statistical division serving all departments of the state government. We concluded that the various state departments would be better served by keeping the statistical divisions within each department as autonomous units directly responsible to their department heads. One of the prime reasons for this conclusion was that the administrative officers of each department are principal users of statistical information and it therefore seemed desirable to maintain a closer contact between statistical divisions and the department heads than would be possible under a giant central statistical division.

No elaborate procedures were set up to coordinate state efforts among the several departments. This was deliberate policy. Progress had to be slow. Self-discipline is not accomplished over night or by strong-arm methods imposed from outside. Remember that the Committee, although having the Governor as godfather, had no legislative birth certificate. The Committee initially met every week and subsequently every other week. It operated chiefly through subcommittees with the secretary doing the detail work for all subcommittees. Consistent with a realistic policy of expediency and with the Committee's parentage, it confined its actions to recommendations for improvement and better coordination. Our tools were persuasion, not coercion. We

hoped by repetition and example to demonstrate our usefulness and cultivate a habit of constant self-appraisal of our activities. The periodic meetings of the Committee gave an opportunity, theretofore restricted, for the departments to acquaint one another with their respective duties and studies, particularly in discussing new studies where attention was focussed on eliminating duplications, pooling statistical information and securing more useful information at less expense. We encouraged this by asking each department to report a summary of its statistical work.

As time went on, the simplification of report forms and the elimination of duplicate reporting burdens or the reduction of such burdens and costs of compliance assumed major importance. Even before the report of the Central Statistical Board on this subject, the Committee arranged for its secretary to make a field trip interviewing corporate officials in order to determine at first hand from their point of view where the reporting burden seemed most onerous. The response of the corporations was most encouraging. Many expressed their gratification that the state was active along this line. As a result of this field investigation a number of helpful suggestions were made to guide the Committee in its first attacks on this problem. Obviously any one state does not have a problem of the federal size with its 97½ million administrative and 38 million nonadministrative returns annually. Nevertheless, when federal returns are superimposed on state reports, or vice versa, no great stretch of the imagination is needed to see that the burden of statistical overhead expense is heavy and becoming heavier.

Merely one illustration of results accomplished by the Committee along this line is the amalgamation of the report forms used by the larger utilities in reporting to the Public Service and Tax commissions. Formerly separate reports containing much duplicate information were required. By conferences with the two departments concerned and the utilities, at which the Committee representatives acted as the liaison officials, it was found that with the change of one schedule in the Public Service Commission report form that form might be used for both purposes. This, together with the use of a thinner paper stock, enabled the utilities to make duplicate copies and save filling out an extra report form. This one change, as well as several others instigated by the Committee, reduced the reporting utilities' annual costs of compliance.

For a broader attack upon this problem the Committee began an inventory, including classification and analysis, of all report forms used by state departments. It was hoped by this work to uncover

other instances than those mentioned by corporate officials in the field where duplicate or unnecessary information was requested.

The field investigation showed that the most severe reporting burden originated with federal agencies or programs. For this reason the Committee envisaged the possibility of cooperation with the Central Statistical Board in harmonizing or simplifying joint state and federal requirements. As part of this work the Committee recommended that all new forms or changed forms used by state departments be referred to the Committee for review prior to their issuance. Unfortunately the limited staff, and other factors halted this work.

The Committee recommended a central index of statistical information either gathered by the state or pertinent to the state, whether the information was published or unpublished. In building this record the Committee intended also to maintain a record of the definitions, methods, coverage, etc. which would affect the interpretation and use of these data. After a test check with one of the departments to determine more exactly the scope of the problems involved, a WPA project was formulated but never finally submitted to Washington and approved so that with the limited Committee staff this work had to be put on the shelf. One of the hoped for results of such an index was to uncover gaps in needed information.

In lieu of extended description I summarize the activities of the Committee looking to the improvement of statistical work of state agencies by listing the subjects of the formal recommendations made by the Committee to the Executive Council. These were:

1. Coordination of annual reports to the Secretary of State and the corporate income tax report, requiring statutory changes.
2. Exchange of portable office equipment among departments.
3. Preliminary report on types of statistical material to be preserved, suggested forms of presentation, and uniform use of the U. S. Government Printing Style Manual for standards.
4. Reducing costs of publication, especially by planographing.
5. Procedure for revision of report forms.
6. Consolidation of report forms of the Public Service and Tax Commissions.

What were the results? Admittedly, we only scratched the surface at a few points. But in my opinion some good was accomplished.

1. The exchange of ideas and information helped to broaden the outlook of some of the departments and gave some of them suggestions found useful in their own departmental work.
2. We earned some public goodwill among a small group of in-

formed and interested persons by showing the state's interest in moderating the growing burden and costs of reporting statistical information to government agencies.

3. We laid the groundwork for securing greater cooperation among state departments each formerly accustomed to go its own sweet way.

4. We effected or stimulated changes which, when fully carried out, made possible savings of over $150,000 annually to the citizens of the state or state departments. This was done with an expenditure of less than $2,500 a year by the Committee.

5. A start was made in inventorying state statistical forms and in suggesting a procedure for their improvement or elimination.

6. We demonstrated a need for concerted efforts to improve and coordinate state statistics and opened up a vista of some things that might be accomplished.

On the other hand, the Committee failed in certain respects. Since the Committee worked through conferences and individual contacts, rather than in a glare of publicity, it did not secure widespread public support. More attention to public relations and the building up of a widespread awareness of the Committee's work among interested and informed persons might have avoided the suspension of its work. Despite repeated efforts without publicity the Committee did not succeed in convincing a new state administration that the economizer's ax should be withheld. Regretfully, I must report to you that the Committee since July 1939 has been in suspension, which, it is hoped, only proves to be hibernation. The appropriation out of which our secretary was paid was cut and no alternative provided. A bill was drafted to give the Committee legislative standing in the Budget Bureau and explicit powers, but it was not introduced in the Legislature. A suggestion was made that the Committee might temporarily secure some outside support, involving no financial burden on an unbalanced state budget, but this received no official support. Until the usefulness, the improvements, and possible economies of a state committee on statistics are envisaged by those charged with primary executive responsibility, hibernation seemed the only recourse.

The chief lessons to be drawn from these experiences are these, as I see them:

1. A state central committee on statistics should be established as a recognized and continuing function, and as part of a permanent and essential state department of such general significance, like a Budget Bureau, that it will not be disestablished by political change. Legislation should sanction such an enterprise.

2. A state committee must have an adequate and competent, full-time staff if it would make any substantial progress. The staff need not be large, but it should be sufficient in number and training to cover the tremendous details involved.

3. The administrative powers of such a central committee should be broad but compulsion should be sparingly exercised, and then only as a last resort. Primary reliance should be placed on persuasion and conferences with state departments and committees of interested citizens.

4. The opportunities for improvement and for economies are far-reaching and many, but they involve much patient attention to details, and require the positive upbuilding of influential public support.

5. Among the chief economies possible, reductions of reporting burdens and costs and of printing costs bulk largest. The former especially requires joint efforts, or at least cooperation, between federal and state central statistical agencies, for in that direction lie the greatest possible economies.

6. Departmental provincialism and specialization are high hurdles to improvement in state statistics. If a central state committee does nothing more than open the door for some fresh air on these statistical islands, it will have served a useful function. When in addition it can pool statistical brains and plan statistical inquiries more effectively and economically, it not only may but will make a significant public contribution.

CLASSIFICATION OF HOSPITAL MORBIDITY

Experience in a Study of Hospital Discharges in New York City*

By Marta Fraenkel, M.D.
Research Bureau, Welfare Council of New York City

The Research Bureau of the Welfare Council of New York City some years ago was given the opportunity to conduct an extended work-relief project. Miss Neva R. Deardorff, at that time Director of the Bureau, together with the Research Committee, then under the chairmanship of Dr. Haven Emerson, recognized that here was the possibility of carrying out a long-thought-of project, namely, the collection of morbidity data on a large scale. A sub-committee was appointed, under Dr. Emerson's chairmanship, that brought together persons competent in medical, statistical, and administrative fields. This committee agreed that the analysis of discharge data on hospitalized patients would best furnish the morbidity data so badly needed. It would at the same time provide data interesting from the point of view of hospital administration and from various social aspects. Miss Helen R. Jeter, Director of the Research Bureau, has been director of this study for the last year and a half.

The collecting, coding, and tabulating of the discharge data were accomplished as a Federal Works Project, known as "Tabulation of Morbidity Statistics."

The study covers a series of data on approximately 576,000 patients discharged from 113 hospitals, both municipal and voluntary, both general and special, in New York City during 1933.

The following discussion will be limited to some of the medical aspects of the subject. These were handled under the direction of a medical technical advisory committee. Likewise under the chairmanship of Dr. Haven Emerson, the committee included Dr. George Baehr and Dr. Ernst P. Boas. I have acted as secretary of this committee for the last year and a half.

Some of the experiences in the study and suggestions for future classification of hospital morbidity resulting from the study will be compared under the following subjects: nomenclature of disease, selection of diagnoses as individual or line items in a condensed list, listing of line items under general group headings in a condensed list, and statistical treatment of combined diagnoses. These are the points that, out of a great number of problems, are selected for discussion.

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 27, 1939.

Nomenclature of diseases. With regard to the naming of the diseases, we faced a difficult situation: the majority of hospitals in 1933 were not yet using the "Standard Classified Nomenclature of Disease,"[1] first published in that year. This situation may, at least theoretically, be considered past history. Any future classification of hospital morbidity may start from the assumption that the physicians in the hospitals use the arrangement of names suggested by Dr. Logie in the standard nomenclature.

The educational influence of this standard nomenclature cannot be over-emphasized. I do not refer to minor points, such as the fact that the author's name of a disease must yield to a descriptive one, that, for instance, "Little's Disease" is now "cerebral spastic infantile paralysis," but I refer to the crucially important point that the exclusive use of Dr. Logie's items bans the use of symptoms and manifestations; it stipulates as diagnoses only those standard terms that combine the anatomical and etiological characteristics of a condition. Certainly there is unanimous agreement on the point that for some time to come this standard work will not be abandoned for diagnostic recording in hospitals as far as nomenclature is concerned, regardless of the subsequent use of the diagnostic data.

Hospital morbidity data are used for various purposes, among which two are of distinctly outstanding importance: (1) medical research and (2) guidance to the improvement of public health and to the organization for the treatment of disease.

For the purpose of medical research the individual case is most important; this means that each hospital, each hospital service, even each individual physician, may collect, list, and tabulate the diagnostic findings on the patients in the special way that is believed to be necessary and useful for specific studies and special publications. Differentiation and refined specialization are appropriate methods in the direction toward this goal; this side of the problem is outside the scope of this report.

For the purpose of guiding public health and hospital administration the approach is statistical. The diagnostic data on the hospital patient are no longer considered as individual and are no longer analyzed as to their specific characteristics; they are considered elements of a mass and are analyzed as to their common features. A statistically guided classification of hospital morbidity data must list the occurring conditions in a limited number of selected items. Generalization and summarization are appropriate methods here.

[1] "A Standard Classified Nomenclature of Disease," H. B. Logie, M.D., C.M., The Commonwealth Fund, New York. 1933.

To eliminate the misunderstandings that repeatedly occur in discussions with hospital authorities, it may be stated definitely that the "Standard Classified Nomenclature of Disease" is and should remain the pattern in accordance with which the physician names diagnostic findings. Statistical work on a general scale, however, must collect these meticuously individualized notations under titles that comprehend several of them.

Selection of diagnoses to be listed as individual items. When the hospital physicians have established the diagnoses of the patients, a multitude of detailed information is at hand. The classification of this detailed information demands a classified list that is suitable, easily understandable, and accepted generally.

Only a list that is not too detailed can be considered as suitable. A process of condensation of the original number of diagnoses to a limited number of selected, more comprehensive diagnoses is therefore necessary. The selection of items is to be made from the statistical point of view; this means that conditions that experimentally have been proved statistically important must appear as individual or line items; conditions that have been proved statistically unimportant must be combined under collective items—"All other conditions of. . . . " The analysis of the more than 576,000 hospital discharges covered by the Hospital Discharge Study must be considered as a mass experience of unprecedented size. The "Classified List of Diagnoses for Hospital Morbidity Reporting,"[2] recently published by the Research Bureau of the Welfare Council as a first result of this analysis, was established according to this principle. The list is composed of some 440 line items.

A guide to the correlation between the two lists involved insures comparability: each individual item in the "Standard Classified Nomenclature of Disease" is assigned to one of the more comprehensive items of the brief "Classified List of Diagnoses for Hospital Morbidity Reporting." A detailed index will be published soon.

Considering the cosmopolitan population of New York City, it is probable that the diagnostic findings that were sufficiently frequent to determine the establishment of the line items may serve as a cross-section of hospital discharges under any urban conditions in the eastern part of this country. The slight changes in the list that may be required occasionally because of epidemic, industrial, and climatic influences can be arranged easily.

Grouping of diagnoses under general headings. A suitable list for

[2] "A Classified List of Diagnoses for Hospital Morbidity Reporting," Research Bureau, Welfare Council of New York City. May 1939.

practical use in the classification of hospital morbidity should also be divided into a small number of groups in which the individual items are related by common characteristics. An arrangement may be considered as adequate that subdivides the total material in such a manner that no doubts exist about the assignment of the individual items. It must be recognized, however, that to find one philosophical principle for this purpose is very difficult.

Of the two elements, etiology and topography, that constitute a diagnosis, the etiological element should be recognized as the guiding principle for hospital morbidity reporting. For instance, tuberculosis of the trachea should be considered primarily as an infectious disease, specifically a tuberculous infection, and only secondarily as an upper respiratory tract condition.

For classification of data from the Hospital Discharge Study we have accepted the "International List of Causes of Death" to a large extent as a model. It is based on a preference for the etiological over the topographical. Agreement is unanimous that this list must be regarded as classic. Enthusiasm for this model of classification occasionally goes so far as to suggest this list, as such, as the adequate tool for morbidity classification. Such enthusiasm must be considered as misguided. The varying importance of conditions as causes of sickness and as causes of death requires a different selection of items for the two lists of conditions. "Hypertrophy of tonsils, adenoids" may be quoted as an example. This diagnosis constitutes over 10 per cent of our hospital discharges, but in the list of causes of death it is only a negligible sub-item of "Diseases of the buccal cavity and annexa and of the pharynx and tonsils."

It would a priori be expected that the strict following of one principle, such as etiology, would permit the logical grouping of all diagnoses. But etiology is only the primary principle for morbidity classification—it is not the only one. Consistency must yield to expediency in certain cases. A classified list either of causes of death or of causes of sickness is primarily a tool for use in practical work, and only secondarily a system that must be followed consistently. Decades of experience with the "International List of Causes of Death" have proved that in daily practice many diseases are considered from the point of view of site.

The "International List of Causes of Death" has arranged nine groups according to etiology; the Hospital Discharge Study has produced five. The difference in the two arrangements is that we do not consider "Congenital malformations," "Early infancy," and "Senility" as independent etiological groups, and that we combine the two groups

"Chronic poisonings and intoxications" and "Violent and accidental deaths" into one, namely, "Traumatic conditions, poisonings."

The following groups were arranged according to their etiological background: first, communicable diseases; second, neoplasms[3]; third, rheumatic diseases, disorders of metabolism and endocrine glands, vitamin deficiencies; fourth, traumatic conditions, poisonings; fifth, obstetrical conditions and diseases, births.

These five groups established on the principle of etiology comprise 158 line items and cover a little over 50 per cent of the total number of diagnoses in our analysis. The other 285 items in our list are arranged in groups that follow the principle of topography, such as diseases of the eye and ear, cardio-vascular diseases, etc. The "International List of Causes of Death," as you know, follows the topographical classification in seven of its groups.

To the logical mind this shift in the basis from etiology to topography seems unsatisfactory. A considerable part of future effort should be concentrated on this dualistic aspect of the lists available at present. This point is emphasized here not for any formalistic reasons but for the very practical reason that, as long as this double-faced aspect of classification exists, doubts, questions, and errors will inevitably exist too, when the list is used for coding or classification by a number of medical record or statistical clerks.

Assignment of items to the groups. The fact that some of the groups are established on the principle of cause, others on the principle of site, inevitably raises in numerous instances the question as to where to assign a certain item. The classification of hospital morbidity is confronted at certain times with the problems and conflicts that are usual in this kind of work—the conflict between consistency and flexibility. Consistency must be abandoned when it threatens to degenerate into formality and rigidity, and it must yield to a certain flexibility, resisting, however, the danger of being lost in arbitrariness and chaos. To pilot cleverly between this Scylla and Charybdis appears to be one of the most difficult problems in the whole task of hospital morbidity classification.

Some examples may illustrate this situation. Foreign bodies are considered, by both the "International List of Causes of Death" and the Welfare Council's "Classified List of Diagnoses for Hospital Morbidity Reporting," as a form of traumatic condition. This seems logical and should not cause any problems. Regardless of whether a man gets coal dust in his eye, a child puts a bean into his ear, or a hysterical

[3] These are included for the sake of convenience, although the exact etiological factor may be lacking.

person swallows a dozen buttons, these are conditions caused by foreign bodies and therefore should be classified under the item "Foreign body." In the "International List of Causes of Death" the majority of such conditions are combined under that specific item; but there are some exceptions: foreign bodies in appendix, joints, and eye are listed separately under the organ involved. The Welfare Council list shows some incidences of foreign body likewise listed under the respective organs. The answer to a question about this apparent inconsistency certainly would be that a foreign body in the eye, for instance, is so definitely an eye condition, viewed from the angle of the hospital, that a rigid adherence to etiology would complicate the situation instead of clarifying it. But is not the same consideration appropriate with regard to many other conditions also? As said before, the decision as to where consistent adherence to the etiological element must yield to a shift to the topographical seems to be one of the main problems in the field.

Other examples are the post-traumatic and post-operative conditions. The limits within which a condition should be classified in accordance with its original etiology (in this instance, trauma or operation) and those within which the original etiology seems too remote to be acknowledged as the true cause of the present condition must be demarcated carefully. A post-operative hemorrhage is doubtless immediately connected with the operation involved and should therefore be classified accordingly. Post-operative adhesions may, however, manifest themselves a long time afterwards; it may even be difficult to reconstruct the connection between the former operation and the present pathological condition. These post-operative adhesions then impose themselves more or less as a new condition. It seems justifiable, therefore, to classify them in accordance with the present "symptomatology," that is, as "Peritoneal adhesions," and not as post-operative conditions.

The situation becomes further complicated when a secondary condition causes a third one, as, for instance, when "Peritoneal adhesions," which may be the subsequent manifestation of an acute appendicitis with peritonitis, cause "Stenosis of bile duct due to adhesions." It seems logical to classify this case, which receives hospital treatment for the bile duct condition, in accordance with the adhesions, that is, to consider the adhesions as the etiology, whereas, strictly speaking, they are manifestations caused by another primary condition.

Statistical treatment of combined diagnoses. In the Hospital Discharge Study the handling of schedules with two or more diagnoses was one of the main difficulties. The previous experience of mortality reporting

thus was repeated. It seems futile to describe in detail the difficulties that confronted us, when 6, 8, 10, even 14 diagnoses were listed indiscriminately without emphasis on the main condition or without indication of etiological or other relations between two or more of the conditions.

The first step in the task of tabulating the discharge schedules was to eliminate all superfluous diagnostic notations and to limit the number of diagnoses per case to a certain maximum. This difficult process of reduction was guided by the following considerations:

1. Four diagnoses were established arbitrarily as an adequate maximum.
2. A certain number of diagnostic notations were eliminated by dropping a complicating condition that more or less regularly accompanies the major condition; examples are: cholecystitis accompanying cholelithiasis, concussion of brain accompanying fracture of skull, acute purulent otitis media accompanying acute mastoiditis. Or typically secondary conditions could be dropped regularly, such as secondary anemia, secondary hemorrhage. Common cold was regularly dropped when associated with another disease.
3. A certain number of other diagnostic notations were eliminated by combining several manifestations of the same etiology under one unitary diagnosis—for instance, laryngitis plus rhinitis under common cold.
4. In cases where these and similar rulings did not succeed in reducing the number of items sufficiently a further reduction was achieved by eliminating individual diagnostic notations that in the particular combination of diagnoses seemed of least importance. This decision as to preference for various elements of a combined diagnosis was made in accordance with the "Manual of Joint Causes of Death."[4]

The combination of all these procedures reduced the number of diagnoses on each schedule to a workable number, not exceeding four in any case. The final tabulation showed that in 78 per cent of the records a single diagnosis had resulted from this process, in 17 per cent two diagnoses had been retained, in 4 per cent three, and in only 1 per cent of the cases were there four diagnoses that were both sufficiently important and sufficiently independent to be retained.

The experience of the Hospital Discharge Study shows that an adequate arrangement of the schedule is a conditio sine qua non. The schedule must provide special questions for the various kinds of diagnoses, the main diagnosis and the additional ones. The very presence of precisely designed rubrics may prevent noteworthy notations from

[4] "Manual of Joint Causes of Death," Third Edition, U. S. Government Printing Office, Washington, 1933.

being omitted and qualitatively different categories of diagnoses from being confused.

The use of an elaborated schedule of this kind requires an exact definition and delimitation of the various categories of diagnoses that are supposed to be reported. The following definitions may be proposed tentatively to characterize the main diagnosis and the most important types of additional diagnoses:

Main diagnosis. The main diagnosis is the final diagnostic statement of the original condition for which a patient was admitted to and treated in the hospital. The main diagnosis may differ from the admission diagnosis because clinical observation and the use of diagnostic facilities of the hospital may correct the original tentative statement.

A case shall never have more than one main diagnosis. All other conditions either treated or merely stated during the hospital stay must, if they are worthy of notation at all, be listed under one of the rubrics provided for other diagnoses.

Occasionally the main diagnosis may not be the one with which the physician or the patient is chiefly concerned—as, for instance, the case of a patient with tuberculosis of the respiratory system who is hospitalized for a fractured arm. Although the health status of the patient may be decided preponderantly by the tuberculous condition, the hospital stay in question is caused by the traumatic condition. The traumatic condition therefore must be listed on the discharge record as the main diagnosis. The tuberculous condition certainly should not be omitted from the record; the ruling for its recording will follow shortly.

Additional diagnoses. The experience of the Hospital Discharge Study has proved that careful handling of the diagnoses other than the main one is necessary in order to avoid incomplete and overloaded records and confusion. Differentiation of these diagnoses as to quality, therefore, seems a basic measure. Three groups may be suggested tentatively, namely, (1) complications, (2) accessory conditions, and (3) chronic states.

What are the main characteristics of these different types of additional diagnoses?

A complication is in direct and immediate connection with the main diagnosis. This connection is in most cases, but not necessarily all, established by the identity of etiology. Examples of complications: acute peritonitis as a complication of acute appendicitis; acute otitis media as a complication of scarlet fever.

An accessory condition is an acute condition that occurs simultaneously with the main diagnosis. There is no direct etiological connection

between the two conditions, but there is in any case a coincidence in the time of occurrence. Examples: measles or diphtheria as accessory conditions with scarlet fever; pneumonia as an accessory condition with pregnancy; furuncle as an accessory condition with leukemia.

A chronic state is a permanent condition or a chronic disease that is merely stated or is both stated and treated during a hospital stay caused by the main diagnosis. This group of diagnoses may cover chronic conditions, such as tuberculosis, syphilis, arteriosclerosis, metabolic conditions, as well as congenital conditions.

It may be emphasized once more that the schedule should provide separate questions for the main diagnosis and the various kinds of additional diagnoses.

Records prepared in this way will facilitate the statistical use of the data. This means that, when the patients are to be classified by diagnosis, the main diagnosis alone will be considered and will furnish the material for an unduplicated count. The question of the occurrence of various diagnoses, however, will be answered by the count of all diagnostic notations, main diagnoses as well as additional ones.

The uniform and routine reporting of diseases by hospitals to a central agency can be considered as the first step in a program of hospital morbidity statistics. For the intelligent publication of such data, however, a systematic classification of disease is necessary.

FACTORIAL DESIGN AND COVARIANCE IN THE BIOLOGICAL ASSAY OF VITAMIN D

By C. I. Bliss
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The development by R. A. Fisher and his co-workers of statistical methods adapted to small numbers has provided the pharmacologist with an important tool. Recently Bliss and Marks (1) have shown some of the possibilities of these methods in the biological standardization of insulin. The technique is suitable for many other bioassays and in some cases it permits a fuller utilization of information inherent in past experiments that have complied with good pharmacological practice. A case in point is the standardization of vitamin D from the ash content of the femur of the rat. This assay has been described in detail by Coward (2), who has given in Table IX all essential data for computing the potency of a sample of cod liver oil by the newer procedures. The purpose of the present paper is to reanalyze this material by factorial analysis with covariance and to propose on this basis a more efficient criterion for measuring the potency of vitamin D.

Coward's model experiment was based upon 36 rats, comprising six litter mates from each of six litters. Soon after weaning, the rats were divided into six groups, each group containing one individual from each litter. Three groups were dosed with the International Standard of vitamin D at rates of 0.025, 0.05 and 0.1 units daily over an interval of six weeks and the other three groups with an unknown sample of cod liver oil at rates of 0.2, 0.4 and 0.8 mgms. daily for the same period. At the end of the test the femora were removed from each rat, fat-extracted with alcohol, dried to constant weight and ashed. The problem here under consideration is how best to determine the content of vitamin D in the sample of cod liver oil from these weights of dried, fat-extracted bone and of ash content.

Analysis in terms of the percentage ash. The experiment has been analyzed first in terms of the usual criterion of response, which is the ratio of these two weights or the percentage of ash in the femora. The determination of relative potency depends upon two factors, the difference in the response to paired dosages of the unknown and of the standard and the rate at which the response increases with dose as measured by the slope of the curve relating dosage and response. If the latter were invariably linear, two doses of each material would suffice, but in the absence of such prior knowledge the results from three or more doses provide a more satisfactory basis. In the present experiment the dosages of both standard and unknown were obtained by multiply-

ing the smallest dose of each material by 2 and again by 2. As a result the difference between standard and unknown was tested at three corresponding levels and at the same time the slope and form of the curve relating dosage and response could be determined for both materials. The experiment was well adapted, therefore, to factorial analysis as described by Bliss and Marks (1).

The percentage of bone ash is given for each of the 36 rats in Table 1,

TABLE 1

PERCENTAGE OF BONE ASH IN AN ASSAY OF VITAMIN D (COWARD)

Litter no.	Percentage of ash following treatment						Total
	S_1	S_2	S_3	U_1	U_2	U_3	
1	20.6	37.6	35.5	24.9	35.2	43.0	196.8
2	25.1	30.5	41.3	32.2	36.4	46.0	211.5
3	24.0	32.9	41.9	33.7	36.1	47.3	215.9
4	23.0	33.3	42.8	31.4	37.9	46.3	214.7
5	24.7	29.5	42.2	24.5	35.7	48.8	205.4
6	22.8	32.4	41.1	34.2	37.7	43.8	212.0
Total	140.2	196.2	244.8	180.9	219.0	275.2	1256.3

where rows represent litters and columns treatments. Since one factor balanced the other, the total variation was divided by an analysis of variance into that attributed to litters, to treatments and to interaction or error. It is evident from Table 2 that the segregation of litter dif-

TABLE 2

ANALYSIS OF VARIANCE COMPUTED FROM THE ASSAY OF VITAMIN D IN TABLE 1

Variation due to	Degrees of freedom	Sum of squares	Mean square
Litter differences	5	42.712	8.5424
Unequal dosage of vitamin D	5	1908.348	
Experimental error	25	169.270	6.7708
Total	35	2120.330	

ferences contributed to the reliability of the experiment even though the improvement was small. For the isolation of the several treatment factors the factorial scheme proposed by Bliss and Marks (1) gave a satisfactory subdivision of the five degrees of freedom between the three treatments with the standard, S_1, S_2 and S_3, and the three treatments with the unknown, U_1, U_2 and U_3. The six subtotals (Y_p) from Table 1 have been entered in Table 3 beneath the corresponding columns of coefficients (x) and multiplied by the coefficients of each row

TABLE 3

FACTORIAL ANALYSIS OF VITAMIN D ASSAY IN TERMS OF PERCENTAGE ASH

Effect	Factorial coefficients (x) for dose						Divisor $NS(x^2)$	Sum of products $S(xY_p)$	Variance $\frac{S^2(xY_p)}{NS(x^2)}$	$\sqrt{[Y^2]}$
	S_1	S_2	S_3	U_1	U_2	U_3				
Samples	−1	−1	−1	+1	+1	+1	36	93.9	$244.92 = D^2$	$15.65 = D$
Slope	−1	0	+1	−1	0	+1	24	198.9	$1648.38 = B^2$	$40.60 = B$
Parallels	+1	0	−1	−1	0	+1	24	−10.3	4.42	
Curvature	+1	−2	+1	+1	−2	+1	72	10.7	1.59	
Opposed curvature	−1	+2	−1	+1	−2	+1	72	25.5	9.03	
Total Y_p	140.2	196.2	244.8	180.9	219.0	275.2	Error		$6.77 = s^2$	$2.60 = s$

to obtain the sum of products $S(xY_p)$ for each treatment effect, leading directly to the five variances, $[Y^2]$.

The treatment effects combined factorial and polynomial analysis. Biologically, the first measured the average difference in response between the three paired doses of standard and of unknown and the second the combined slope of the parallel straight lines relating percentage ash to the dose of vitamin D, where each dosage interval of 0.3010 logarithm is equal to 1. The remaining three terms showed that the relative potency and its error could be computed legitimately from these first two items. The third treatment effect or the interaction between samples and slope measured the divergence from parallel dosage-response curves for standard and unknown and was less than the mean square for error; the fourth row or the quadratic term in fitting a polynomial to both standard and unknown signified that the combined curvature from a linear relation was negligible; the fifth row or the interaction between the quadratic term and samples indicated a curvature in opposite directions that exceeded the experimental error by too small a margin to have any significance. Hence the last three variances passed the test as a valid assay.

Relative potency was determined from the variances for the difference between samples and for slope. As shown elsewhere (1), the log-ratio of potencies, M, can be computed from the equation

$$M = kID/B$$

and its standard error from

$$s_M = skI\sqrt{D^2 + B^2}/B^2,$$

where D^2 and B^2 are the treatment variances for sample and for slope, I is the interval between doses in logarithms or 0.30103 in the present experiment, s is the standard deviation from the mean square for error

and k is based upon the ratio of $S(x^2)$ for slope to that for the difference between treatments and for three dosage levels is equal to $\sqrt{8/3}$ or 1.6330. Substituting the values from Table 3,

$$M = (1.6330)(0.30103)(15.650)/40.601 = 0.18949$$

and

$$s_M = (2.6021)(1.6330)(0.30103)\sqrt{244.92+1648.38}/1648.38 = 0.03377.$$

This log-ratio of potency of $M = 0.1895 \pm 0.0338$ had yet to be corrected for the potency of the unknown cod liver oil which was assumed in planning the experiment since U did not represent the same units as S. Eight mg. of cod liver oil were assumed to contain one unit of standard vitamin D, so that the logarithm of 8 was subtracted from the initial M to obtain $0.18949 - 0.90309 = -0.71360$ as the logarithm of the units of vitamin D in each milligram of oil. Transforming to original units, this particular sample of cod liver oil has been found to contain 193.4 ± 15.0 units of vitamin D per gram. Thus the factorial analysis in Table 3 has provided terms for measuring relative potency and a test of the hypothesis of parallel, linear dosage-response curves upon which the calculation depends.

Analysis in terms of the log-weight of ash. Although the percentage of ash in the fat-extracted bone has proved a valid index to the vitamin D in the diet, it involved an implicit assumption which may be questioned. It assumed that the percentage of ash was constant at any given dose of vitamin D, so that if the weight of ash be designated by A and the weight of fat-free organic matter by B, $A/(A+B) = K$. Then

$$A = KA + KB,$$

$$A(1 - K) = KB,$$

$$A = \frac{K}{1 - K} B$$

and

$$\log A = \log \frac{K}{1 - K} + \log B.$$

It is clear that the use of percentage ash involved the assumption that for individuals treated alike the logarithm of the ash content plotted against the logarithm of the organic content lost in ashing gives a straight line with a slope equal to 1. If the observed slope were to differ appreciably from unity or from linearity, the percentage ash would represent a less efficient criterion for measuring vitamin D than a more consistent value. In testing this postulate, however, it was essential to avoid the loss in precision due to differences between litters.

Covariance answered all of these requirements. For the dependent variate the percentage ash was replaced by the log-weight of the ash (Y), which was to be adjusted by covariance for differences in the log-weight of the organic matter lost by combustion (W). The results are given for each rat in Table 4, from which the sums of squares and

TABLE 4

ORGANIC AND ASH CONTENT OF DRY BONE OBSERVED IN ASSAY OF VITAMIN D

	Litter no.	Data for treatment						Total
		S_1	S_2	S_3	U_1	U_2	U_3	
Log-weight of organic content (W)	1	.792	.714	.893	.876	.801	.825	4.901
	2	.820	.818	.792	.790	.833	.829	4.882
	3	.877	.916	.893	.804	.925	.928	5.343
	4	.805	.753	.846	.787	.834	.885	4.910
	5	.802	.809	.811	.911	.719	.799	4.851
	6	.793	.774	.865	.783	.831	.886	4.932
	Total	4.889	4.784	5.100	4.951	4.943	5.152	29.819
Log-weight of ash (Y)	1	.207	.494	.633	.396	.537	.702	2.969
	2	.346	.459	.640	.467	.590	.760	3.262
	3	.377	.606	.751	.511	.678	.880	3.803
	4	.281	.450	.720	.449	.619	.820	3.339
	5	.318	.431	.674	.423	.464	.778	3.088
	6	.262	.453	.708	.498	.614	.778	3.313
	Total	1.791	2.893	4.126	2.744	3.502	4.718	19.774

products, $[W^2]$, $[WY]$ and $[Y^2]$, have been computed for differences between litters, for each of the treatment effects listed in Table 3 for and the error (Table 5), the calculation following the procedure described

TABLE 5

COVARIANCE IN THE ASSAY OF VITAMIN D FROM LOG-WEIGHT OF BONE ASH

Variation due to	Degrees of freedom	Sums of squares and products			Adjusted mean $[Y^2]$	$\sqrt{[Y^2]}$
		$[W^2]$	$[WY]$	$[Y^2]$		
Litter differences	5	.028473	.039365	.068422	.010393	
Unequal potencies	1	.002070	.016334	.128881	$.121546 = D^2$	$.3486 = D$
Combined slope	1	.007073	.073971	.773645	$.740308 = B^2$	$.8604 = B$
Lines not parallel	1	.000004	.000150	.005430	.005362	
Similar curvature	1	.005653	.005219	.004818	.002733	
Opposed curvature	1	.000578	−.000926	.001485	.001937	
Experimental error	25	.058279	.013277	.036914	$.001412 = s^2$	$.0376 = s$
Total	35	.102130	.147390	1.019595		
Coefficients for adjusting $[Y^2]$		.051901	−.455636	1	$b_c = \frac{.013277}{.058279} = .22782$	

by Bliss and Marks. From the row for error, $b_e = [WY]/[W^2] = 0.228$, a value so much smaller than the 1 assumed in using the percentage ash as the criterion of response that it did not differ significantly from zero. After segregating differences due to the dosage of vitamin D and to litters, the amount of combustible matter in the bones had but little effect upon their ash content. Because the effect was so small, the weight of the organic matter in this assay could be ignored altogether and the potency of vitamin D determined from the log-weight of ash alone. In other cases, however, the weight of the organic matter may have a significant effect upon the weight of the ash, and even here the adjustment for W reduced the standard deviation (s) from 0.0384 to 0.0376, so that it has been retained. Since the experiment was designed to measure the potency of a sample of cod liver oil rather than to test the statistical significance of any given treatment effect, adjusted $[Y^2]$'s have been used and the coefficients b_e^2, $-2b_e$ and 1 have been entered in the appropriate columns to facilitate their computation.

The mean adjusted $[Y^2]$'s determined from the log-weight of ash (Table 5) may be compared with the corresponding terms based upon the percentage ash (Tables 2 and 3), noting first that the new criterion segregated a larger part of the total variation under differences between litters. Of the treatment effects the fifth term, that for opposed curvature, had about the same relation to the error in either unit, but with the new criterion both the term for combined curvature and especially that for departure from parallelism were relatively larger. However, the ratio of neither adjusted $[Y^2]$ to that for error exceeded the 5 per cent level and since the reduced $[Y^2]$'s, which are appropriate for tests of significance, would give no larger a ratio, the dosage-response curves for standard and unknown could be considered as parallel straight lines suitable for the determination of relative potency.

It may be contended, however, that the usual 5 per cent fiducial limit is not applicable in the present case. The curve relating log-dose and response probably flattens out as it approaches both an upper and a lower limit and within a middle dosage range a straight line is essentially a convenient approximation. To justify its use the experimental data should lie within the central part of the complete curve where the relation is so nearly linear that it cannot be distinguished experimentally from a straight line. Since this linear central portion has a limited range, any departure from parallelism or from linearity which exceeds the 20 per cent level of significance should be scrutinized. The present experiment is a case in point and the adjusted mean log-weight of ash for each dose has been plotted in Fig. 1 to see if the distribution of the observations indicated an approach to either a "floor"

or a "ceiling." Instead the plotted points were found to differ in the opposite direction to that required by this hypothesis, the only alternative to a straight line which is biologically reasonable. In consequence, the customary 5 per cent fiducial limits applied here and the experiment could be accepted in terms of the log-weight of ash as a valid assay.

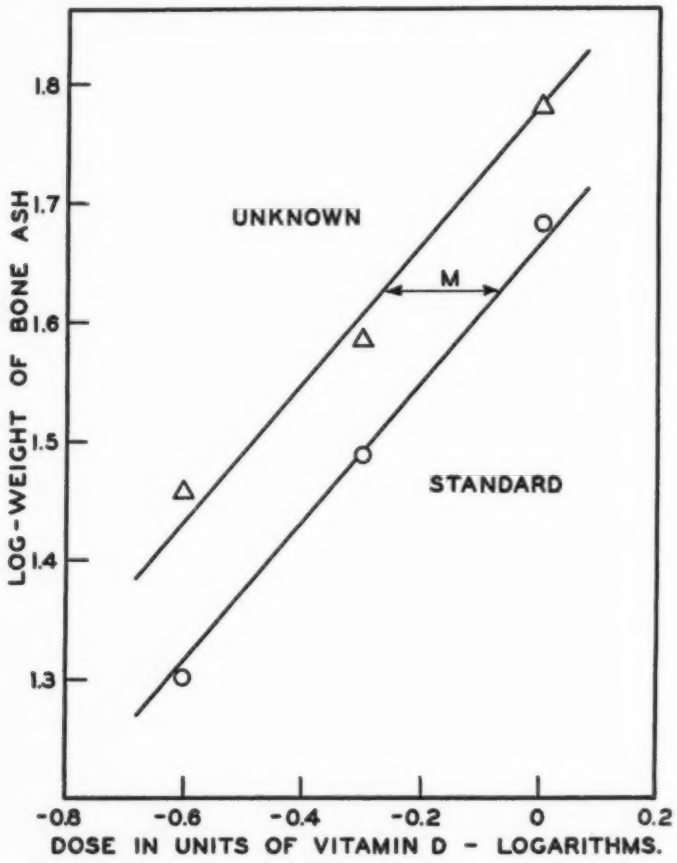

Fig. 1. Relation between the log-weight of bone ash and the log-dose of vitamin D as computed in Table 5, the means adjusted for the log-weight of organic content. Dosage of cod liver oil (the unknown) is given in assumed units of standard.

The computation of M and s_M from D, B and s of Table 5 paralleled that in the preceding section, giving $M = 0.1992 \pm 0.0232$ in arbitrary units. When corrected for the assumed potency of the unknown, 1 gram of cod liver oil assayed at 197.7 ± 10.6 units of vitamin D, dif-

fering but little from the 193.4 units computed from the percentage ash. By correcting the weight of the ash by its observed relation to the weight of the combustible matter (in logarithms) instead of by the artificial value assumed in using percentages, the standard error of the determination has been reduced from 15.0 to 10.6 units of vitamin D. To obtain a comparable improvement with the percentage ash as the criterion of response, the number of experimental animals would have to be doubled. If variations in the log-weight of the organic content of the bones had been ignored, 1 gram of cod liver oil would have assayed from the log-weight of ash alone as containing 198.4 ± 10.6 units of vitamin D, a value nearly identical with that obtained from the adjusted estimates.

It would be premature to conclude from this one assay that the weight of the organic component of the bone could always be neglected in the assay of vitamin D. It is probable, however, that any information in such measurements can be utilized effectively by covariance as illustrated above. Two possibilities which might complicate the correction have been examined. It is conceivable that the apparent unimportance of W was partly due to fitting a straight line instead of a curve. This has been tested by introducing W^2 as an additional term and fitting a polynomial but the variation in Y attributable to the quadratic term was negligible, being less than the mean square for error after adjustment by linear covariance. Another possibility is that the slope (b) of the straight line relating Y to W is itself a function of the dose of vitamin D. When checked by computing b for each dose separately, both with and without a correction for litter differences, no such relation could be detected. If the analysis of covariance as illustrated here does not decrease the standard deviation effectively, no other available correction would be expected to give a better result.

The rats in the assay included 16 males and 20 females, divided equally between standard and unknown. A possible sexual difference in response has been checked by adding a second concomitant measure to the analysis in Table 5, designating males by the numeral 1 and females by 0. In terms of $[Y^2]$ the variance attributable to differences between sexes was 0.001259 or less than the mean square for error where sex was disregarded (0.001412).

It has been assumed throughout that the variance was independent of treatment and, within the sampling error, constant throughout the experiment. In some assays the variance has proved to be a function of the mean, which, if true here, would require a more involved calculation. In this assay, however, the variance within doses showed no indication of being tied to the mean, whether computed from the observed

log-weights of ash or from values that had been adjusted for differences both in W and between litters.

Summary. A reexamination of an experiment by Coward on the assay of vitamin D from the ash content of the femur of the rat shows that the estimation of relative potency and its error can be facilitated by factorial analysis. When the customary criterion of response, the percentage of ash, was replaced by the log-weight of ash, the increase in the precision of the assay was equivalent to doubling the number of observations.

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(1) Bliss, C. I. and Marks, H. P. (1939) *Quart. J. Pharm. Pharmacol. 12*, 182.
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INTERDEPENDENCE IN A SERIES

By Lila F. Knudsen*
Food and Drug Administration

In linear regression and many other statistical procedures together with their tests of significance, one of the fundamental assumptions involves the independence and randomness of the observations. The question has been raised at various times as to whether this assumption of independence is valid in the application of the correlation or regression procedure to certain types of data. This question is not new and several proposals have been made in attempts to make observations independent of time or space.

Professor Poynting in "A Comparison of the Fluctuations in the Price of Wheat and in the Cotton and Silk Imports into Great Britain" (1) advocated replacing the price of the year by the average price for a short period (i.e. four years.)

B. Cave and Karl Pearson (3) use Student's proposal of correlating successive differences of two variates proceeding until the correlation between Δ_x^m and Δ_y^m equals the correlation between Δ_x^{m+1} and Δ_y^{m+1}. As pointed out by Max Sasuly in *Trend Analysis* (12) p. 61, the using of higher order differences effectively eliminates the effect of time and position in space from theoretical smooth curve series, but fails when applied to actual data because higher order differences tend to emphasize the random errors existing in the data. Yule (5) admits the tendency of the variate difference method (p. 537) "to lay stress on one particular oscillation of short duration only." This is confirmed by examination of the standard deviations of the data and its differences given in (3) Table IV, page 351 by Miss Cave and Professor Pearson. The standard deviations of the first order differences are approximately 1/5 to 1/10 of the standard deviations of the actual quantities, incidentally showing a high degree of serial correlation. The standard deviation of the second order of differences is sometimes smaller than that of the first order differences, but for higher order differences the standard deviations become increasingly larger. In three cases the variation of the sixth order of differences is over twice as large as the standard deviations of the quantities of actual data. In one case, coal, it is three times as great. If the data were independent of each other originally, the following relations should hold:

$\sigma_{1d_x} = \sigma_x\sqrt{2}$ and $\sigma_{2d_x} = \sigma_{1d_x}\sqrt{3}$ etc. Where σ_x is the standard deviation of the actual data and σ_{1d_x} is the standard deviation of the first differences of the actual data, (from O. Anderson (13)).

* The author wishes to acknowledge with thanks the suggestions and encouragement of Mr. Alexander Sturges of the Bureau of Labor Statistics, Washington, D. C.

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Summary. A reexamination of an experiment by Coward on the assay of vitamin D from the ash content of the femur of the rat shows that the estimation of relative potency and its error can be facilitated by factorial analysis. When the customary criterion of response, the percentage of ash, was replaced by the log-weight of ash, the increase in the precision of the assay was equivalent to doubling the number of observations.

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In linear regression and many other statistical procedures together with their tests of significance, one of the fundamental assumptions involves the independence and randomness of the observations. The question has been raised at various times as to whether this assumption of independence is valid in the application of the correlation or regression procedure to certain types of data. This question is not new and several proposals have been made in attempts to make observations independent of time or space.

Professor Poynting in "A Comparison of the Fluctuations in the Price of Wheat and in the Cotton and Silk Imports into Great Britain" (1) advocated replacing the price of the year by the average price for a short period (i.e. four years.)

B. Cave and Karl Pearson (3) use Student's proposal of correlating successive differences of two variates proceeding until the correlation between Δ_x^m and Δ_y^m equals the correlation between Δ_x^{m+1} and Δ_y^{m+1}. As pointed out by Max Sasuly in *Trend Analysis* (12) p. 61, the using of higher order differences effectively eliminates the effect of time and position in space from theoretical smooth curve series, but fails when applied to actual data because higher order differences tend to emphasize the random errors existing in the data. Yule (5) admits the tendency of the variate difference method (p. 537) "to lay stress on one particular oscillation of short duration only." This is confirmed by examination of the standard deviations of the data and its differences given in (3) Table IV, page 351 by Miss Cave and Professor Pearson. The standard deviations of the first order differences are approximately 1/5 to 1/10 of the standard deviations of the actual quantities, incidentally showing a high degree of serial correlation. The standard deviation of the second order of differences is sometimes smaller than that of the first order differences, but for higher order differences the standard deviations become increasingly larger. In three cases the variation of the sixth order of differences is over twice as large as the standard deviations of the quantities of actual data. In one case, coal, it is three times as great. If the data were independent of each other originally, the following relations should hold:

$\sigma_{1d_x} = \sigma_x\sqrt{2}$ and $\sigma_{2d_x} = \sigma_{1d_x}\sqrt{3}$ etc. Where σ_x is the standard deviation of the actual data and σ_{1d_x} is the standard deviation of the first differences of the actual data, (from O. Anderson (13)).

* The author wishes to acknowledge with thanks the suggestions and encouragement of Mr. Alexander Sturges of the Bureau of Labor Statistics, Washington, D. C.

In correlating a group of ten economic indices of Italian prosperity with a Synthetic Index, they found the "actual correlations of the indices . . . an arid and scarcely undulating waste of high correlation (page 353) . . . . There has been no source more fruitful of fallacious statistical argument than the common influence of the time factor (page 354)." One of their criticisms of the variate-difference method is that the terminal values of a short series seem to be of very great importance.

G. Udny Yule (5) states that "the time correlation problem may be said to be the isolation, for separate study, of oscillations of differing durations" (page 501), not the isolation of random residuals which would give only zero correlations between sampling limits. Both Yule (5) and Tintner (21) give a good list of references on the variate-difference method.

In the discussion following this same article, R. A. Fisher makes the criticism that use of the variate-difference method assumed that there were no lagging correlations, "that the only correlation between those series was the correlation between corresponding terms—x, and y." The method "unfortunately entangled up the adjacent lagging correlations into expressions from which it was impossible to extricate them, but it did successfully eliminate any secular change which could be represented by the terms up to the sixth degree."

Bartlett in "Some Aspects of the Time Correlation Problem" (7) mentions the possibility of testing the significance of the correlation coefficient "by considering the distribution of values it would take if all the sample values of one variate are permitted to correspond in turn to all sample values of the second variate." But here again the interrelationship of the observations or the lagged correlations makes this test invalid. Bartlett's criticism of the variate-difference method is that among other things it is very inefficient in the estimation of a correlation coefficient near zero. He gives a table showing the efficiency corresponding to differences up to the fifth order. For first order differences one-third of the information is discarded; for second order differences, almost one-half, etc. He advises using the usual tests as a preliminary measure. These, of course, will include as significant some correlations that should not be included. He also advocates division of the covariance into two or more parts to see if one part may be contributing a greater share of the observed relationship.

Economic data, price series in particular, have been scrutinized as possible violators of the "law of independence of observations." The usual test for independence of successive observations is the calculation of the correlation between the price one year and the price the

next. This correlation between u_s and u_{s+1} is r_1, between u_s and u_{s+3} is r_3, etc., where u_s is the value of the variable (price) in the year s. In a note in the *Journal of Farm Economics* (16) the author has shown that such correlations in a price series do not conform with Yule's definition of serial correlation (6). That is, in price series

$$r_2 \neq r_1^2, \qquad r_3 \neq r_1^3, \qquad \text{and} \qquad r_4 \neq r_1^4.$$

However, we believe the term "serial correlation" is generally divorced from Yule's definition and merely implies the relationship between u_s and u_{s+n} without implying any equality between r_n and r_1^n. In the remainder of this paper, the term "serial correlation" will not refer specifically to Yule's definition.

Price series exhibit a marked degree of serial correlation. A study has been made here of several price series in an attempt to answer several questions: How much interdependence exists? Is the serial correlation the same for a series of commodities as for a series of groups of years? Do the suggested uses of first differences or deflation eliminate serial correlation?

Farm prices of twenty commodities were obtained from the Bureau of Agricultural Economics and the *United States Department of Agriculture Yearbook*, for a period of 1910 to 1937. These prices were for the crop year, which began in July for prices on oats, barley, potatoes, flaxseed, wheat, and tobacco, in June for apples, in August for cotton, and in October for corn. For the remaining commodities, oranges, grapefruit, milk, butterfat, beef cattle, calves, lambs, pears, chickens, eggs, and hogs, the crop year begins in January. For each of these price series r_1, r_2, r_3, and r_4 were calculated. First differences were taken for each price series and r_1, r_2, r_3, and r_4 were calculated for the first difference series. Then each series was deflated by means of division by the appropriate index of wholesale prices of all commodities. (The Bureau of Labor Statistics index numbers of wholesale prices for the various crop years were used.) The first four serial correlation coefficients were then calculated for the deflated prices. Thus three types of serial correlation were investigated: that for ordinary price series, that for first differences of the price series, and that for a deflated price series. Figure 1 shows the variation of the serial correlation coefficients for the three types of price series (actual, first differences, and deflated) for each of the twenty commodities. The downward trend of the value of r_i as i increases from 1 to 4 is very marked for the actual prices, i.e., there is a lower relationship between prices taken every fourth year than between prices for adjacent years. As a general rule, the serial correlation coefficients for the deflated prices are a little lower than

those for the actual prices. Differencing the series produces a negative value of r_1 and r_3 for crops such as applies, oranges, and grapefruit where alternate years have larger crops.

FIGURE 1

AMOUNT OF SERIAL CORRELATION IN PRICES OF 20 COMMODITIES—1910–37

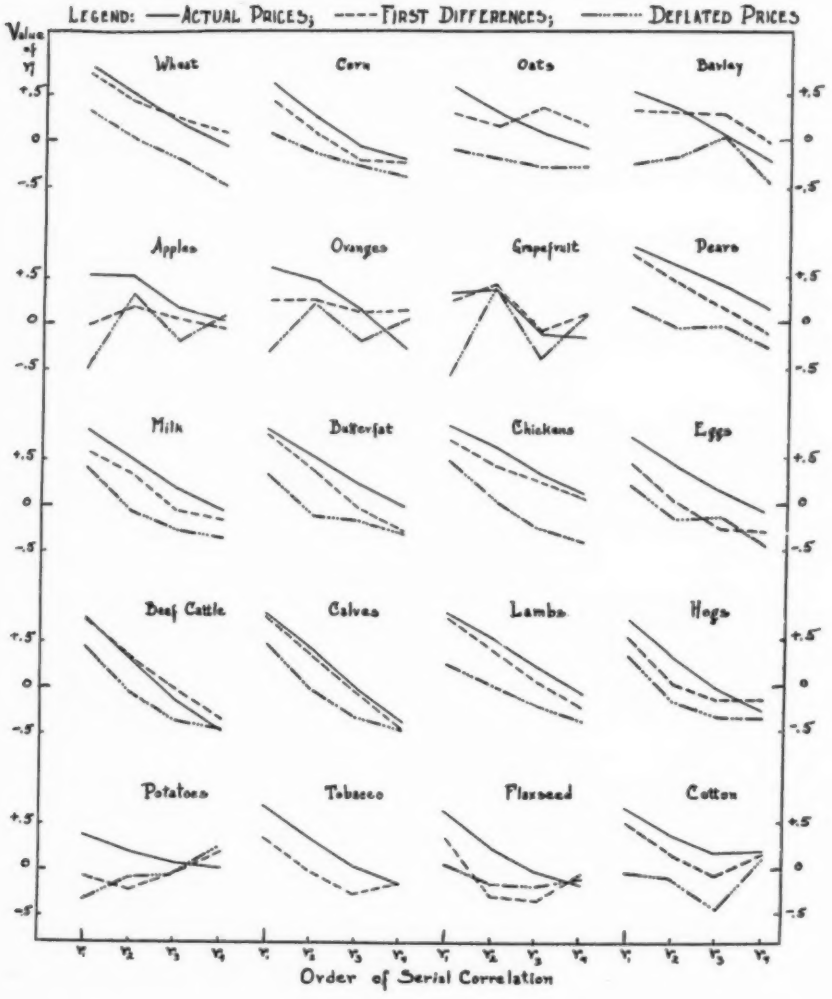


Figure 2 shows the frequency with which different values of the various coefficients of serial correlation occur, each dot representing one commodity. The solid limit lines indicate the range within which the correlations observed in 19 samples out of 20 might be expected to

FIGURE 2

DISTRIBUTION OF SERIAL CORRELATION COEFFICIENTS
PRICES OF 20 COMMODITIES, 1910-1937

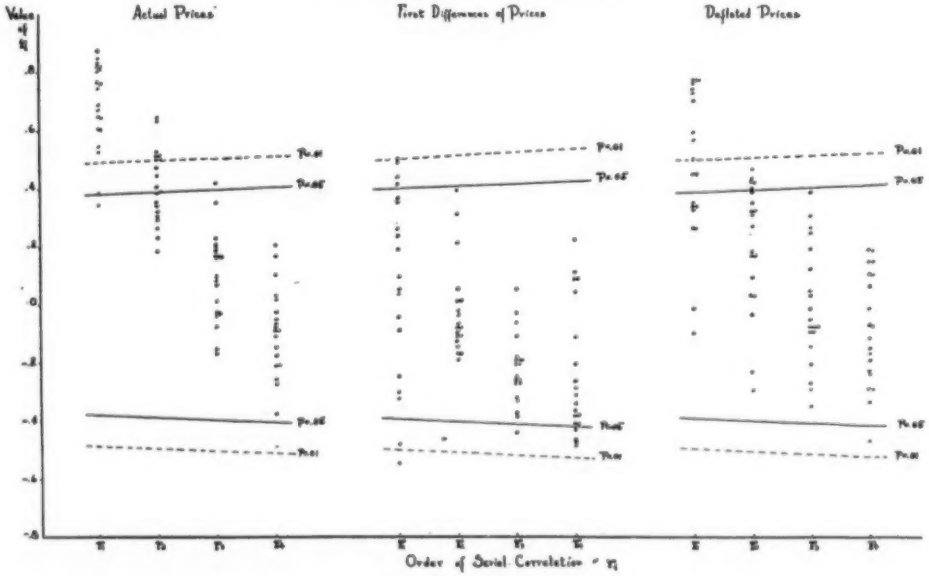
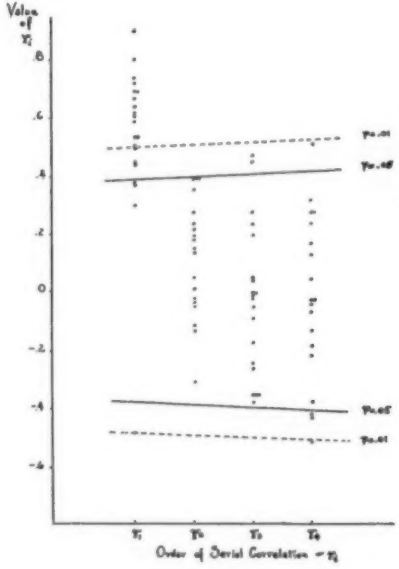


FIGURE 3

SERIAL CORRELATION COEFFICIENTS
WHEAT PRICES, 20 PERIODS, 1397–1936



fall if these samples had been drawn from a population whose correlation was zero. The dotted limit lines are similar but refer to odds of one in one hundred. Note that in the case of actual prices the distribution of values of r_1 and r_2 are not at all what would be expected on the basis of independence; the values of r_3 and r_4 do lie in the expected range. The correlations of deflated prices behave similarly. With first differences the r_1 distribution has unusually wide variation; the r_2 distribution, however, falls into the expected range. Hence, using actual or deflated prices 3-year intervals would appear to be necessary to secure independence while 2-year intervals are required between first differences.

Since the price of one commodity is not entirely independent of the price of another commodity, comparisons were desired which would eliminate this difficulty. The price of wheat per bushel in England, by years, from 1397 to 1936 (early years from the 1922 *United States Yearbook of Agriculture*, Table 50, page 605) was used to obtain twenty successive periods of time each composed of 27 years (to make the number of years comparable with the interval used for all commodities.) Serial correlations were calculated for the actual prices of each of these twenty periods. These are plotted on figure 3. Each dot here represents one period of time. Again the same properties are exhibited as for the actual prices of twenty commodities, although the twenty periods of time are independent of each other.

Prices of commodities are not the only type of data that exhibit serial correlation, and other types of data than economic data exhibit this interdependence in a series. Most time series can be suspected and should be critically examined before statistical methods involving assumptions of randomness and independence of observations are applied. The sizes of rivets manufactured in one machine during a small space of time would not be independent observations. The amount of fruit in cans of peaches being packed successively in a cannery will be serially correlated, whereas if the cans of peaches were taken from the packing line at widely spaced intervals of time over several days the amounts of fruit in each can will tend to be independent of the amount of fruit in any previous or successive can. The weekly observations on the growth of a rat or guinea pig would not be independent of each other. These are merely a few of the types of data that do not constitute independent observations because of position in time.

Then there are various types of data that have serial correlation because of position in space. The classic example of this is weather observations at adjacent weather stations ("Correlation of Weekly Rainfall," R. A. Fisher and W. A. Mackenzie (11)). The yield of wheat from a series of small plots of ground with the same fertilizer and treat-

ment would show serial correlation in that adjacent plots would have more similar yields than non-adjacent plots.

Another type of serial correlation is that introduced artificially by taking an initially random series and calculating a "moving average." The resulting series is serially correlated. The amount of serial correlation depends on the weights and number of terms entering into the "moving average."

Differencing a random series whose serial correlation is zero forms another series whose serial correlation is *not* zero. For instance, the serial correlation r_1 in a series of second differences of a random series is -0.67, and the r_1 in a series of third differences of a random series is -0.80. (See (4) and (14).)

Residuals from a linear regression may be serially correlated. If the true regression is curvilinear (say parabolic) and a straight line is fitted to the data, the residuals will all be negative at the upper and lower ends of the line and positive in the center.

CONCLUSIONS

Price series have a large amount of interdependence among the observations taken adjacent years or adjacent years but one. In the price series used here observations taken every third year seem to be practically independent. If first differences of yearly prices are used every other difference may be taken to form an independent series. Deflation removes very little (if any) of the existing serial correlation.

Prices are not the only type of data that show interdependence in a series. Any time series to which a smooth curve can be closely fitted, and many series in space, exhibit serial correlation. This interdependence is produced by underlying causes which affect not one but several observations in the same way. There may be an accumulation of underlying causes. Serial correlation may also be produced artificially by the use of a moving average (which is merely using a series of underlying causes each to affect several adjacent observations similarly). This interdependence affects significance tests more seriously than is realized.

Many remedies for this problem have been suggested and used, such as: the variate-difference method; the divisability into several cycles and the use of a method analogous to Hotelling's "Principal Components"; the fitting of a trend and using the "random" fluctuations from that trend; the fitting of Fourier series or polynomials (orthogonal or otherwise) and using the constants obtained from the curves instead of the original data (i.e. (19)); and no doubt many other methods with which the author is unfamiliar. Of the four remedies above, it seems

that the last mentioned is the most reasonable, yet it too has its weaknesses. The question of what to do about serial correlation is still largely unsolved, though it seems that half the battle is won if we realize what its habits are and in what surroundings it nests.

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NOTE ON TESTS OF DEPARTURE FROM NORMALITY

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Introduction. In analysing large samples, a frequently used technique[1] of testing for departure from normality is to compute g_1/s_{g_1} and g_2/s_{g_2} (where

$$g_1 = \frac{k_3}{k_2^{3/2}}, \qquad g_2 = \frac{k_4}{k_2^2},$$

$$s^2_{g_1} = \frac{6N(N-1)}{(N-2)(N+1)(N+3)}, \qquad s^2_{g_2} = \frac{24N(N-1)^2}{(N-3)(N-2)(N+3)(N+5)}$$

and N is the number in the sample) and to see whether or not

$$(1) \qquad \left|\frac{g_1}{s_{g_1}}\right| > c_\alpha, \qquad \text{or} \qquad \left|\frac{g_2}{s_{g_2}}\right| > c_\alpha$$

where $c_\alpha = 1.96$ if $\alpha = .05$, i.e. if a .05 level of significance is being used. If either or both of the inequalities (1) is satisfied, then it is customary to say that the hypothesis that the sample is a random sample from a normal distribution is rejected,[2] the probability of error in that statement being α if the sample is in fact a sufficiently large sample from a normal distribution.

The purposes of this note are to demonstrate that the technique outlined above will lead to error more frequently than expected, and to suggest two alternative techniques which avoid that error although there is no reason given why either of them are good methods to use.

Suggested tests. If the probability that at least one of the inequalities (1) is satisfied is computed, it turns out to be $2\alpha - \alpha^2$, or if $\alpha = .05$, then the probability that at least one of the inequalities (1) is satisfied is .0975. Thus, in rejecting the hypothesis of normality in accordance with (1) if $\alpha = .05$, the probability that an error will be committed is .0975, not .05.

[1] The statistics used in the test are defined by R. A. Fisher, *Statistical Methods For Research Workers*, section 14. However, Fisher does not explicitly state that he favors following the erroneous procedure embodied in the equations, (1).

[2] It is noteworthy, however, that this is rarely stated. Generally, some comment on the degree of skewness or kurtosis is made. Yet, such comments are in order only if the hypothesis of normality has been rejected. The computed values of g_1 and g_2 may then lead to a new specification of the distribution. This distribution could then be tested by a new sample.

The statistical procedure cannot be regarded as one of estimating γ_1 and γ_2 (the true values of g_1 and g_2), rather than of testing the hypothesis of normality, for if the distribution were non-normal then s_{g_1} and s_{g_2} would assume other values than those given above, and consequently they could not provide fiducial or confidence limits for non-normal distribution. On the other hand, if the distribution is normal, then $\gamma_1 = \gamma_2 = 0$, and there is no need of estimation.

Some change in technique thus becomes desirable. Both of the two tests suggested in the following paragraphs satisfy the condition that the probability of error in following the rule of rejection is α if c_α is used as a critical value.

The first test is based on the fact that the probability that at least one of two independent events occur is $2\alpha-\alpha^2$ if the probability that each occur is α. Using p to denote the probability of error, we have $\alpha=1-\sqrt{1-p}$ as the general equation. For values of p less than .25 it is satisfactory to take $\alpha=p/2$, since the maximum error, which occurs when $p=.25$, is the difference between .125 the estimated value of α, and .131 the calculated value of α.

To use this test, it is necessary to decide on the probability of error, p, which is desired. Then, α will be the probability of error of each event If a .05 level of significance is being used then the equations (1) become

$$\left|\frac{g_1}{s_{g_1}}\right| > 2.25, \qquad \left|\frac{g_2}{s_{g_2}}\right| > 2.25 \tag{2}$$

and the test is "At least one of the two inequalities (2) is satisfied."

The other test is based on the χ^2 distribution, and consists of forming

$$\chi^2 = \left(\frac{g_1}{s_{g_1}}\right)^2 + \left(\frac{g_2}{s_{g_2}}\right)^2$$

and entering the χ^2 distribution with two degrees of freedom.[3] If a .05 level of significance is being used, then values of g_1/s_{g_1} and g_2/s_{g_2} such that the inequality

$$\left(\frac{g_1}{s_{g_1}}\right)^2 + \left(\frac{g_2}{s_{g_2}}\right)^2 > 5.991 \tag{3}$$

is satisfied will lead to the rejection of the hypothesis of normality.

Four distinct tests of normality have finally been obtained, one based only on g_1, one based only on g_2, and two based on both g_1 and g_2. The real statistical problem is to determine which of these tests is better under what conditions, or what other test[4] is "best." Unfortunately, there does not appear to be any unique "best." It is quite likely that if the hypotheses alternative to the normal distribution are all

[3] Still another test would be obtained by the application of Fisher's method of combining the results of several independent tests of a hypothesis to obtain a single total test. This method is given by Fisher, *loc. cit.*, section 21.1.

[4] There are many such tests of the hypothesis of normality, including the χ^2 test of goodness of fit, and the tests based on moments and cumulants of order higher than the fourth. In fact, any region of possible sample values having probability p may be called a test. The major aim of statistical science is to distinguish among such possible tests.

skew distributions, but are mesokurtic, then the g_1 test is superior to any of the others, that if the hypotheses alternative to the normal distribution are all symmetric, but are platykurtic or are leptokurtic, then g_2 test is superior, and that if the alternative hypotheses are of both types, then some combination of g_1 and g_2 will yield the most efficient test.

The author hopes to present at an early date a mathematical discussion of the problem from the point of view of power functions.[5]

It has been shown that a frequently used technique of testing for departure from normality leads to errors more frequently than expected. Alternative techniques have been suggested. The comments apply equally to the Pearson β_1 and β_2 tests of normality, and to the a, $\sqrt{b_1}$ test of normality of E. S. Pearson and R. C. Geary.[6] Tests may easily be constructed which are related to these tests in much the same way that the tests given above are related to the g_1 and g_2 tests of normality.

[5] Power function analysis is discussed by J. Neyman and E. S. Pearson in *Statistical Research Memoirs*, vol. I, pp. 1–37 and vol. II, pp. 25–57, as well as in other of their publications.

[6] This test is given in *Tests of Normality* by R. C. Geary and E. S. Pearson (1938), University Press, London. This publication was reviewed in this *Journal* in September, 1938.

STATISTICAL NEWS AND NOTES

Conference on Employment and Pay Roll Statistics

Statisticians from the 16 State offices[1] which have cooperative arrangements with the Bureau of Labor Statistics for the collection of employment and pay roll statistics participated in a conference with B. L. S. staff members in Washington on June 24, 25, and 26. Similar meetings had been held in 1936, 1937, and 1938. The development of the Federal-State cooperative arrangements for the collection of these data and an account of the 1938 conference were summarized in an article in the September 1938 issue of this JOURNAL (pp. 575–9).

The Secretary of Labor welcomed the delegates and spoke briefly in appreciation of the progress which had been made in the improvement of employment statistics, both by the States and by the Federal Bureau. Miss Perkins pointed out that the figures issued by the agencies represented were widely used by other government offices and business firms, and that basic data have been of value in the setting up and administering of agencies dealing with relief, social security, and public employment offices. She emphasized the need for statistical data which is arising in connection with planning the National Defense program.

The Commissioner of Labor Statistics, Isador Lubin, and the Chief Economist of the Bureau, A. F. Hinrichs, both addressed the conference, and stressed also the need for labor statistics in the present national emergency—in connection with questions of reputed labor shortages, the supply of workers in various industries and localities and of varying degrees of skill, overtime, rates of wages and hours, etc.

Necessarily the discussion and training program this year revolved around many of the same topics which had been discussed previously—industrial

[1] Those in attendance were: Arkansas—G. B. Segraves, Jr., Statistician, Department of Labor; California—M. I. Gershenson, Principal Statistician, Division of Labor Statistics and Law Enforcement, Department of Industrial Relations, and Kenneth C. Aitken, B. L. S. representative; Illinois—Clayton R. Thompson, Chief, Division of Statistics and Research, Department of Labor, and Robert S. Barker, B.L.S. representative; Indiana—Homer E. Marsh, Supervisor, Statistical Section, Unemployment Compensation Division, Department of Treasury, and Ralph W. Tyner, B.L.S. representative; Kansas—Jeff A. Robertson, Commissioner, Department of Labor, and Crystal Wheeler, B. L. S. representative; Maryland—Madeleine V. Dunne, Statistician, Office of Commissioner of Labor and Statistics, and S. Emelin Curtiss, B. L. S. representative; Massachusetts—Roswell F. Phelps, Director, Division of Statistics, Department of Labor and Industries; Michigan—John E. Cogan, Statistician, Department of Labor and Industry, Minnesota—Roy L. Solem, Director, Research and Statistics Section, Division of Employment Security, Department of Social Security, and Irene Greene, B. L. S. representative; New Jersey—Abe Rothman, B. L. S. representative with the Bureau of Statistics and Records, Department of Labor; New York—Elizabeth Corr, Division of Statistics and Information, Department of Labor; North Carolina—Edward F. Barbee, Department of Labor, and Kate E. Frisbie, B. L. S. representative; Pennsylvania—Kenneth Snader, Bureau of Research and Information, Department of Labor and Industry, and Erma W. McKinney, B. L. S. representative; Helen M. Conine and Robert R. Williams, Department of Research and Statistics, Federal Reserve Bank of Philadelphia; Texas—Mary Warren, B. L. S. representative with the Bureau of Business Research, University of Texas; Wisconsin—Orrin A. Fried, Statistician, Industrial Commission, and George A. Rothfuss, B. L. S. representative.

classification, the representativeness of the sample, and problems of collection, editing, and tabulation of the data.

Mr. Kolesnikoff of the staff of the Central Statistical Board spoke on the standard industrial classification which has been developed by an interdepartmental committee, and described the system of grouping and coding industries. Copies were distributed of a tabular comparison of the present B. L. S. classification for manufacturing industries with those of the Census and of the proposed standard. The Bureau plans to adopt the Census classifications, which conform generally to the standard classification, when the returns for the 1939 Census are available.

The 1935–39 base period recommended by the Central Statistical Board for general-purpose index numbers met with general approval. Since the B. L. S. industrial classification follows that of the Census, the shift to the new base period can not be made until the 1939 Census figures are released. The Census plans to reclassify the 1937 figures on a comparable basis, and a special project is receiving consideration which would provide for the reclassification of the data for 1935 as well.

There was greater use at this meeting of the device of committee findings in the formation of policy. The reports of the six committees appointed to consider special problems are summarized below; they represent in the main an exploration of the many aspects of the technical problems involved and, while the reports were accepted by the conference, the recommendations of the committees are to be studied further both in the States and in the Bureau before definite policies are adopted.

Conversion factors for reducing reports to a weekly basis. All reports received from cooperating firms covering a period of more than one week are reduced to a weekly basis. The reports of about two-thirds of the companies cover a one-week pay roll. The remaining firms report for a longer pay-period—a half month, month, 10 days, etc. In reducing the latter reports to a weekly basis, the conversion factors used to secure the one-week equivalent should take account of the number of working days in the period covered by the report, whether the employees are on a wage or salaried basis, whether the firm's operations cease on Sundays and holidays, or are continuous as in the case of hotels, telephone and telegraph companies, etc. The recommendations of the committee were that:

(1) The collection agency should determine the number of days per week that each reporting firm normally operates and the days on which it is normally idle.

(2) When firms normally operate five days per week, the conversion factor should be obtained by taking 5 as the numerator of a fraction whose denominator is the number of days in the period reported minus the number of days that the firm is normally idle. For example, if such a firm is normally idle. on Saturday and Sunday and its report covers the period from the 1st to the 15th, including two Saturdays and two Sundays, the factor should be $5/(15-4)$, or $5/11$, or .454545.

(3) For firms normally operating on a 7-day week basis, the conversion factor should be a fraction whose numerator is 7 and whose denominator is the total number of days in the period reported. For example, if the report covers a calendar month, the factor would be 7/28, 7/30, or 7/31, depending on the number of days in the month.

(4) For insurance and brokerage firms the present procedure, based on a 7-day week, 30-day month, should be continued. An alternative and possibly preferable procedure would be to use as a numerator the number of pay periods in the year (12 for reports covering an entire month and 24 for reports covering a half month) and as a denominator the number of weeks in the year (52).

(5) For continuous-operation industries, such as crude petroleum production, hotels, telephones and telegraph companies, and electric light and power, continue to use as a conversion factor a fraction whose numerator is 7, and whose denominator is the total number of days in the month.

(6) Wherever possible, reports for salaried workers should be secured separately and edited as outlined for insurance and brokerage firms.

Paid vacation earnings and hours, bonuses, payments in kind, etc. In the case of reporting companies granting vacations with pay, it was recommended that the present method of handling the reports be continued: that the firm be asked to report the number of employees on vacation with pay, the amount of vacation pay and the man-hours paid for, and that these data be included in the aggregate figures. This procedure avoids showing an apparent decline in employment in firms where vacations with pay are in effect, and also avoids the inclusion of vacation pay in the pay-roll totals with no corresponding inclusion of employees and hours worked; average earnings and hours figures are, thus, not distorted. The problem is further complicated, however, by the practise in some firms of allowing employees nominally on vacation to continue to work, thus drawing regular pay in addition to vacation pay. This situation is particularly likely to occur in the industries supplying materials important in the defense program, such as aircraft, machine tools, engines, etc. Special treatment will be necessary in these cases. The statistical agencies handling the employment reports are urged to check each firm's schedules carefully on the matter of vacation pay.

While it is desirable to secure reports on bonus payments as a part of the national income picture, they are not to be included in pay-roll figures unless they are of the type paid regularly, for example, production bonuses. It was recommended that the Bureau make a special study of the prevalence and types of payments in kind, and of the extent to which they affect the earnings figures. It is believed impractical to attempt to include in the reported pay-roll data estimates of the cash value of such payments, but the committee recommended that an inquiry be made into the experience of other agencies in securing information on payments in kind.

Commissions are included in pay-roll figures. In the case of companies which furnish the prior month's commissions together with current employ-

ment and wage figures, the committee recommends using the commission data along with the current reports if they do not vary greatly from month to month, as preferable to withholding from the tabulations the reports of important firms. Wherever possible, commission and pay-roll data should pertain to the same period.

Inclusion in the sample of small establishments. The committee based its considerations in part on an analysis comparing the size and type of firms in the B. L. S. sample for retail trade with those shown by the 1935 Census. The study disclosed that in general the B. L. S. sample averaged a higher number of employees per store than shown by the Census. By individual line of trade, the proportional coverage is highest in the lines where the typical establishment is comparatively large. In nearly all kinds of trade the weekly earnings of employees covered by the B. L. S. sample was somewhat higher than for those included in Census reports, probably due to the fact that the Bureau sample tends to be drawn from among larger stores in cities rather than from smaller stores in rural areas.

Pending further analysis and conference with B. L. S. staff members, the committee suggested the possibility of classifying establishments in the reporting sample for different lines of retail trade by size groups and computing changes in employment, hours, and earnings separately for the various-sized stores. Employers' reports to State unemployment compensation agencies should be of help in determining classifications by size groups. The current changes so obtained could be weighted and applied to estimated totals for the industry.

The sample was found also to be more representative for chain than for independent stores, due in large part to the difficulty and expense involved in collection from a large number of small independent establishments. The recommended grouping of the reports by size of firm and type of operation should aid in minimizing this lack of balance.

Full-time and part-time employment and earnings. The schedule in use at present calls for a combined report of both full-time and part-time employees, and their total pay rolls. Hence the average weekly earnings figures published are lowered in some cases, particularly in retail trade, by the inclusion of part-time workers. A special analysis of reports to the New York Department of Labor, which requests a separation of full-time and part-time workers, showed marked variations between the average weekly earnings figure published and the earnings of full-time or part-time employees.

The committee pointed out that in industries where part-time work is prevalent, the average hourly earnings figures are more valid than those for weekly earnings. While an ideal program would provide for the separation on all reports of full-time and part-time workers, the difficulties of collection and the expense involved in tabulating the schedules would probably make it prohibitive. As a minimum, it was recommended that special studies be made from time to time which would aid in interpreting the regularly published figures.

Handling of reports for firms going out of business or starting in business; growing and declining industries. In surveys showing current employment changes and trends over a period of years, made on a sample basis, the problem arises of when to drop from the reports firms which are going out of business, particularly in declining industries, and of when to include new firms, particularly in growing industries. The Bureau's figures in the past have tended to have a bias downward, when compared with Census levels, probably due to the fact that declining firms are carried in the sample while companies starting in business are usually not included until they have been in operation for some time. It should be noted that the B. L. S. and a number of the cooperating States adjust their data to periodic Census reports to correct for any upward or downward bias in the current figures. The conference also discussed means of keeping informed regarding new firms coming into the business picture.

In cases of new firms growing rapidly, the committee suggested that in order that they should not exert undue influence on the movements shown by the reporting sample, their figures be reduced by the proportion that the sample in the industry concerned bears to total employment in the industry. This editing should not be necessary for all firms; the criterion should be the size of the sample and the effect of the company in question.

The treatment of firms going out of business is made difficult because in most cases there will have been a gradual decline before the collecting agency is notified that the company is closing down permanently. In cases where employment drops suddenly, the same scaling down of the magnitude of the drop was suggested as described above for new firms. The committee recognized that the general trend in the industry must be taken into account when editing reports for individual firms.

Estimates of total nonagricultural employment. The new series of B. L. S. estimates of total nonagricultural employment in each of the 48 States and the District of Columbia were described. They supersede the former estimates of nonagricultural employment for the United States. The source of data used and methods of estimating are set forth in a mimeographed release available from the B. L. S.

There are two general series for the country as a whole: one, designated "Total Nonagricultural Employment" shows the number of persons engaged in gainful work in the United States in nonagricultural industries, including proprietors and firm members, self-employed persons, casual workers, and domestic servants; the second, described as "Employees in Nonagricultural Establishments," is limited to employees only and does not include proprietors or the self-employed, domestic servants, and casual workers. It is the second series for employees only which is available by industrial groups and for each State separately.

In several States, the estimates are prepared in cooperation with the State agency, and plans were made whereby other States wishing to publish the figures locally would be furnished with the basic data tables. On the basis

of current reports, the State could issue, each month, a preliminary figure subject to revision when final or more complete data are available through the State or Federal agencies.

Announcement was made of the reorganization of the research section of the B. L. S. division of employment statistics, providing for an enlarged staff. Such expansion would permit the Bureau to give increased attention to technical problems of the type raised at the conference.

A more detailed account of the proceedings at the conference is included in the minutes, which are available upon request to the U. S. Bureau of Labor Statistics.

ERNESTINE WILKE

Bureau of Labor Statistics

Division of Statistical Standards, Bureau of the Budget
(Formerly Central Statistical Board)

On July 25, 1940, the Central Statistical Board, created by an Act of July 25, 1935 (49 Stat. 498) and transferred to the Bureau of the Budget by Section 2 of Reorganization Plan No. 1, ceased to exist. Its functions are now carried on by the Division of Statistical Standards of the Bureau of the Budget under the authorities of the Bureau. Mr. Stuart A. Rice, Chairman of the Board, has become Assistant Director of the Bureau in charge of the Division of Statistical Standards.

The Director of the Bureau of the Budget has appointed a Statistical Advisory Committee with the members of the Board serving for the present as members of the Committee. Mr. Rice has been designated Chairman of the Committee.

National Defense Activities. At the request of the Bureau of Research and Statistics of the National Defense Advisory Commission, the Division of Statistical Standards made a canvass of all new statistical activities and plans related to the national defense emergency. General information on emergency activities which have been started and those which are being planned or contemplated has been collected for the use of the Executive Office and the National Defense Commission.

Morris A. Copeland, Director of Research for the Division of Statistical Standards, has been detailed as a consultant to the Bureau of Research and Statistics of the National Defense Advisory Commission and will serve as liaison officer with the Division.

Frederick Osborn has joined the staff of the Bureau of the Budget as a special consultant on population problems in particular relation to the national defense emergency under the authority granted to the President in the Supplemental Appropriation Bill for National Defense to appoint outstanding persons at a compensation of $1 per annum.

Convertibility List of Occupations. The Joint Committee on Occupational Classification of the American Statistical Association and the Central Statis-

tical Board has prepared a Convertibility List of Occupations for use in classifying and coding occupational data. This list was discussed in two articles in this JOURNAL, *The Convertibility List of Occupations and the Problems of Developing It* by Gladys L. Palmer in the December 1939 issue and *An Industrial Classification for Reports From Individuals* by Bruno Fels and P. K. Whelpton in the March 1940 issue. It is expected that copies of the Convertibility List will be available in September.

Report on Construction, Housing and Real Property Statistics. In the latter part of 1939 at the request of the Director of the Budget the Central Statistical Board undertook a survey of the information collected by Federal and private agencies interested in the fields of construction, housing, and real property. The staff of the Board made an extensive examination of reports collected by the various agencies, prepared an analysis of the available information and gave consideration to the important gaps in this information. It is expected that the report will be available some time in August.

Progress of Work in the Bureau of the Census

National Defense. A definite liaison has been established between the Bureau of the Census and the Bureau of Research and Statistics of the Advisory Commission to the Council of National Defense. At present the Bureau is supplying the Council with maps showing the location of various industries in 1937 as measured by the number of wage earners and the value added by manufactures.

The Bureau is also concentrating on completing the 1939 Manufactures and Mines reports for 37 strategic industries and for minerals considered important by the Advisory Commission of the Council of National Defense.

The Sixteenth Decennial Census. At the time of writing (July 20) the field work for the Decennial Census is practically complete. Although about 50 of 529 district offices are still open, the bulk of the schedules are already in Washington and preliminary releases are being issued in various subject-matter fields to make data available as soon as possible.

Because of several factors, including the last-minute addition of the Census of Housing, the burden on the enumerators and the supervisors was rather heavy. With a fine spirit of cooperation on the part of the general public and sincere effort on the part of the workers, the task of taking one of the most complete inventories of the nation's population, activities, and resources is nearing successful conclusion.

Population. Populations of various areas have been and are being announced in accordance with the following general plan. The first preliminary announcement was made by the supervisors upon completion of the enumeration for each county and each city of 10,000 or more persons, and for smaller places in some areas. As the supervisor's reports are received in Washington, they are given nation-wide circulation in another series of preliminary announcements covering cities of over 25,000. These are followed by a series of preliminary releases for States, showing populations by coun-

ties, and for cities of 10,000 or more inhabitants. The results of the hand count by small areas are announced as soon as completed, State by State, in the first series of bulletins. It is expected that the first of these bulletins will be printed by the end of August, and the bulletins for the other States will be released as soon as possible thereafter. It is planned to include urban-rural and metropolitan district data in this first series of bulletins.

Tabulations showing the characteristics of the population will be presented in subsequent series of bulletins. A special feature of the tabulations of the 1940 results will be the presentation of more detailed statistics for the outlying areas of metropolitan districts.

Infant Cards. In the course of the enumeration of the population census, a special infant card was filled out by the enumerator for every infant under 4 months of age. These cards are being checked against birth records, thus providing a basis for a two-way check of the completeness of the enumeration of infants in the census and of the completeness of the birth registration in the various States.

In censuses throughout the world under-enumeration of children has always been encountered in spite of efforts made to counteract this phenomenon. For some reason an infant is not always reported to the enumerator along with other members of the family.

The use of the infant card represents one aspect of the special efforts which were made in this Census to insure a more complete coverage of infants. About 700,000 infant cards are being matched against approximately the same number of birth records.

Housing. The first housing releases will give the number of occupied dwelling units, vacant dwelling units for sale or rent, and other vacant dwelling units by wards in cities of over 100,000, by incorporated places of 2,500 or more and for States by counties.

The next series of Housing releases will give data on characteristics of dwelling units by blocks for each city of 50,000 or more population and by wards for cities of 5,000 to 50,000 inhabitants. Incorporated places of 1,000 to 5,000 inhabitants will be presented separately and each county will be presented by minor civil divisions with separate figures for rural-farm dwellings. These tabulations by small areas are in demand from many sources and will be especially useful for local planning. The subsequent tabulations for larger areas will present the characteristics of dwelling units in greater detail.

Manufactures. Preliminary Census of Manufactures releases are issued for individual industries as soon as the last important schedule is received. A number of these releases have already been issued. Following the last of these preliminary industry releases, the U. S. summary and geographic reports will be prepared.

The Division of Manufactures has prepared two booklets in cooperation with the Central Statistical Board's Committee on the Standard Industrial Classification to be used for the 1939 Census of Manufactures. One is the Industry Classification which is on sale by the Superintendent of Docu-

ments. The other booklet is the Alphabetical List of Products. The last time such a list was compiled was in 1919. This list will be of great value in classification of industries which, as a general rule, depends upon the product of greatest value manufactured in the reporting establishment.

Mines and Quarries. The coverage of the 1939 Census of Mines and Quarries has been extended. This was accomplished not only by making every effort to include all producers of minerals in each separate canvass, but also by including canvasses of certain segments of the mineral industries formerly covered by censuses of Mines and Quarries but not included in the 1929 Census; and also by including certain segments that have never before been canvassed. The most important operations in the first of these segments are those required in the production of crude petroleum, natural gas, and natural gasoline. The production of these minerals requires more wage earners than the production of all other minerals combined except coal. The fact that they were excluded from the 1929 Census of Mines and Quarries increased the importance of including them in the 1939 Census.

Three segments of mineral industries being covered which were never canvassed prior to this census are oil and gas contractors, general mining contractors, and the mining of clay for the production of heavy clay products. Most important of these is the canvass of oil and gas contractors.

Printing and Publications. The data collected by the Census Bureau is used by many public agencies and by private groups and individuals in almost every field of endeavor. It is the responsibility of the Bureau to collect that information which will be of the most value to the greatest number.

In order to insure the widest distribution and use of the materials gathered, a new division has been set up in the Bureau for the period of the Decennial Census. The Printing and Publications Division will assume the responsibility for the publication and distribution among the general public of the census reports.

Quarterly Employment Survey of State and Local Governments. An enthusiastic response has been accorded the quarterly survey of employment and payrolls of State and local governmental units which was begun by the Bureau in January of this year. This survey represents a consolidation of the efforts of four agencies which have been compiling independent series of data.

The number of employees and amounts of payroll, classified by general governmental functions and public service enterprises, are reported by a comprehensive sample of different types and sizes of governmental units. Data for two quarters have already been collected and published, and the survey for the third quarter is now in progress.

C. L. D.

Division of State and Local Government, Bureau of the Census

During the past year the Bureau of the Census, through its Division of State and Local Government, has expanded and improved its reporting of

official statistics of State and local government finances and activities. The yearly compilations of financial statistics of States and of cities over 100,000 population are being continued with many refinements. In addition, several new current series are now being compiled by a recently established Current Reports Section. These developments, which are described in detail below, point toward an increasingly significant flow of State and local government data from the Bureau to Federal, State, and local officials, to governmental researchers, and to the public.

Financial Statistics of States. The final report, *Financial Statistics of States: 1937*, has just come off the press. This volume is the first in the resumption of a series extending from 1915 to 1931. A new classification of State revenues and expenditures, taking into account the many changes in State finance since 1931, is used. To facilitate comparability between the old and the new classifications, a figure reconciling the two classifications is presented. Statistics of public-service enterprises will be reported separately to facilitate inter-city comparisons of the functions of general government. Formerly these data were included with those for general government. Careful treatment has been given to State grants and shared taxes, for which detailed statistics are presented for the first time.

An attempt has been made to prepare the report in a more informative and interesting style, pointing out some of the implications of the data presented rather than confining the text to definitions interspersed with brief factual statements.

A procedure different from that in 1937 is being followed in 1938. The reports will be issued in three volumes: Vol. 1. An individual State report for each of the 48 States. These reports will be numbered consecutively, 1 through 48, as issued, with the name of the State and date of release. Vol. 2. A Summary Bulletin for States: 1938, and related special studies that may be made, which will be numbered consecutively. Vol. 3. A final report entitled *Financial Statistics of States: 1938.*

A mailing list will be maintained for the reports in Volumes 1 and 2. These reports, as they are released, will be sent without charge to all names on the mailing list, and a notice will be sent when Volume 3 is published. Requests for the reports in Volumes 1 and 2 should be addressed to the Director of the Census, Washington, D. C. Volume 3 will be available from the Superintendent of Documents, Washington, D. C., at a price to be fixed by him when it is printed.

The individual State reports for 1938, which comprise Volume 1, are being released as they are prepared. They have been improved both in general appearance and in content over those for prior years. In the text, departure has been made from the terse, stereotyped presentation used formerly. Emphasis has been placed on the general story, and there are brief explanations in the text for any marked changes in the figures for 1938 as compared with those for 1937. Tables presenting detailed quantitative data on public-service

enterprises, as well as on separate overlying units of government, have been included for the first time.

Agents in the field are now completing the collection of data for the 1939 report.

Financial Statistics of Cities. The final report, *Financial Statistics of Cities over 100,000 Population: 1937*, has gone to press and will be issued about October. This volume, the latest in a series which extends back to 1898, will incorporate many new changes. The classification of municipal revenues and expenditures being used beginning with the 1937 report was developed in cooperation with the National Committee on Municipal Accounting. Like the report for States, public-service enterprises are reported separately, and the report itself is written in a more analytical and interpretive style than previously. The reports for 1938 will be issued in three volumes similar to the State reports.

The individual city reports (Vol. 1) are now being released as prepared. Changes in form and content have been made corresponding to those in the State reports.

Field agents are now finishing the collection of data for the 1939 report.

State and Local Government Quarterly Employment Survey. Work is progressing on reports for the third quarter of the new quarterly employment survey covering State and local employment as of July 31, and pay rolls for the month of July 1940. This survey, which was instituted in January 1940, represents a consolidation of effort of four agencies which had been compiling independent series of data on State and local government employment and pay rolls. While monthly data have been available for many years on employment and pay rolls of the Federal Government and of various types of businesses, current figures on State and local employment and pay rolls have been conspicuously lacking. The new survey, using the mailed questionnaire method, supplies this information for a comprehensive sample of governmental units of different types and sizes. Available from this survey, are also estimates of the total number of governmental employees and total governmental pay rolls, as well as index numbers showing changes from quarter to quarter.

Reports have been issued for the first quarter covering January 1940 and for the second quarter covering April 1940; similar reports for the third quarter will be released as prepared. The reports cover the following data:

General Summary.
Information for each individual reporting government:
  States
  Cities having populations:
    Over 25,000
    10,000 to 25,000
    5,000 to 10,000
    2,500 to 5,000
    Under 2,500

Counties having populations:
Over 50,000
Under 50,000
Distribution of employees by governmental functions.

Other Current Reports. In addition to the quarterly employment survey, the newly-established Current Reports Section is also preparing current annual reports on State tax collections, State and city election proposals, and State and local government debt. The State tax collection survey is in its second year, and the State and city election proposals' canvass is in its third year, these two annual studies having been inaugurated by the Division of State and Local Government in 1939 and 1938, respectively.

Municipal Reference Service. Indispensable to the statistical work of the Division are the facilities of the Municipal Reference Service. Its special collection of materials in the field of State and local government, currently maintained, makes available information concerning all phases of governmental affairs. When the Service was established in 1937, its purpose was to create for the use of all Federal agencies as well as the local units, a central depository and clearing house of municipal information. The expansion of the Division's activities, however, necessitated the extension of the coverage of the Service to include States and many other units of government.

In addition to aiding the Division, the Service also provides information on State and municipal governments to Federal, State, and local officials and research agencies, sends out on loan to interested persons in the field of government selected material from its documentary collection, prepares bibliographies, and performs special research.

Special Studies. Recently published were 1939 Supplements to the *Digest of State Laws relating to Net Income Taxes, 1938* and to the *Digest of State Laws relating to Inheritance and Estate Taxes, 1938*, bringing the information up to January 1, 1940.

Research. In connection with the work of compiling financial statistics of the States and of the large cities, the Division is carrying on a program of statistical research in current problems of governmental finance affecting the State and city reports. An extensive investigation is being made of grants, shared taxes, and other interlevel fiscal transactions. Plans are being formulated for the presentation for 1938 of more adequate statistics on these subjects. Studies relating to the number, types, and characteristics of local units of government, State and municipal housing authorities, revenue bonds, and similar State and municpal problems are under way.

HUGH G. INGERSOLL

Board of Governors of the Federal Reserve System

Revision of the Federal Reserve index of industrial production has been completed. A brief description of the composition and the methods used in compiling the revised index is published in the *Federal Reserve Bulletin* for

August, together with indexes for the total and for individual industries and groups of related industries. The revised index is different from the former one in a number of important respects. It is much more comprehensive, including data for a number of important industries not formerly represented, particularly industries that have grown rapidly in the past 10 or 15 years and industries in more advanced stages of manufacturing. Some of these new series were developed from statistics of employment and hours of work, with adjustment for changes in productivity, and provide the first available current data of productive activity in a number of important industries. Other current series, where necessary, have been adjusted to conform to more comprehensive but less frequently reported bench-mark data. As a result of these changes the new index shows much more growth than the old one and also shows slightly less erratic short-term movements. The broader cyclical movements, however, are similar.

A new edition of the *Federal Reserve Chart Book* was issued in July 1940 carrying data available on June 14, 1940. The price of the book is 50 cents.

Division of Tax Research, United States Treasury Department

The Division of Tax Research of the Treasury Department has for the period May–July 1940 published two studies in the *Bulletin of the Treasury Department*. The May 1940 issue contained an analysis of regular Federal grants-in-aid to States as of January 1, 1940, showing the administrative authority and purpose of the grant, the year established, the appropriation for the fiscal year 1940, the annual appropriation authorized, the basis of apportionment, and the matching required of States. The June 1940 issue presented a study of dividends received by corporations, covering in general the period 1926–1937, as compiled from corporation income and excess-profits tax returns for those years.

The Income Tax Study project in Philadelphia, conducted under the supervision of this Division with funds transferred from the Work Projects Administration which was outlined on page 371 of the June 1939 issue of this JOURNAL and on page 131 of the March 1940 issue, has been extended for three months beyond June 30, 1940.

Federal Deposit Insurance Corporation

The Annual Report of the Federal Deposit Insurance Corporation for the year ending December 31, 1939, has been issued. The report summarizes the insurance operations and supervisory activities of the Corporation over the entire period of its existence and contains statements of supervisory principles and standards, of the Corporations' conception of the proper scope of bank supervision, and of the financial requirements of the deposit insurance system. In addition, the report sketches briefly banking developments over the past six years and contains numerous statistical tables relating to these developments.

The report presents for the first time comprehensive data based upon examinations of most of the commercial banks of the country, holding over 98 per cent of the deposits of commercial banks of the United States, and comprehensive data of bank earnings, expenses, and disposition of profits. A number of tables present frequency distributions of banks according to their capital ratios, ratios indicative of the quality of their assets, and ratios relating to their earnings position. Other tables analyze variations in the condition of banks arising out of differences in geographic location and in size of bank.

Securities and Exchange Commission

In May, 1940, the Commission issued a study entitled "Cost of Flotation for Small Issues 1925–1929 and 1935–1938" submitted to it by the Research and Statistics Section of the Trading and Exchange Division. This study presented detailed statistics regarding the cost of flotation for issues of less than $5,000,000 for two periods deemed to be representative of conditions prevailing prior to and subsequent to the enactment of the Securities Act. Data for the earlier period were obtained from questionnaires sent out by the Commission and for the latter period were based upon registration statements which became effective under the Securities Act. Statistics were presented covering variations in cost of flotation according to type of security, size of issue, size of issuer, industry, method of offering and yield. While the report contained detailed data for bonds and preferred stocks, no information was presented covering common stock issues because of the inadequacy of available data.

Beginning with January 8, 1940, the daily data on trading for their own account by members of the New York Curb Exchange were supplemented by a breakdown of the number of shares sold into long and short sales. This followed by seven months the release of like statistics for the New York Stock Exchange. The regular weekly release containing such figures now also includes the total amount of daily short sales on each of the New York exchanges, including non-members' short sales as well as those of members.

The Public Utilities Division released a report dated November 20, 1939, on the dividend status of preferred stocks of registered public utility holding companies and their electric and gas utility subsidiaries as of December 31, 1938. The report consisted of ten tables and accompanying text covering dividend arrearages and their size distribution by systems, dividends paid in 1938, and number of preferred stockholders. The statistics were classified by operating companies, holding companies, holding company systems, and by individual issues. The Division also issued a summary of the financial statistics of 188 electric and gas subsidiaries of registered public utility holding companies for the year 1939, continuing a similar report for the years 1937 and 1938. The report showed financial data and 14 ratios for all companies, with assets of $5,000,000 or more, having securities outstanding with the public. Another report gave detailed statistics for all securities of electric

and gas utilities, issued during the five-year period ending December 31, 1939. This report showed the price at which each security was offered to the public, or sold privately, the price paid by underwriters, the net proceeds to the issuing company and the market price range, where available, from the date of issue to December 31, 1939.

In the first half of 1940 the Work Projects Administration project sponsored by the Commission, known as the Survey (formerly Census) of American Listed Corporations, released three volumes of a new series of reports, each of the volumes covering nine industries. These reports generally include information for the fiscal years 1934–1938, supplementing 23 reports in an earlier series and presenting for the first time information on four industries for which reports had not been released previously.[1]

The Survey of American Listed Corporations has recently completed Part One of a Statistical Summary covering about 2,000 corporations with total assets of almost $80 billions. The summary presents data for an even wider range of industries than that available heretofore and covers many additional items of information contained in the registration statements filed under the Securities Exchange Act of 1934 which have never previously been presented in statistical form. Part One is composed wholly of information for the single year 1937 in order to provide a comprehensive picture based upon a maximum number of companies. In addition to covering general information on the registrants and their security issues, detailed balance sheets, income accounts and surplus reconciliation tables for a variety of groupings, such as industry, size, capital structure, and rate of return on net worth, are presented. A further section of the study is devoted to a presentation of financial ratios for companies classified in a number of ways. Part One may be released in the fall of 1940. Part Two of the Statistical Summary, which is now in process and planned for release some time in 1941, will consist of combined balance sheets, income accounts, surplus reconciliation statements and financial ratios for the years 1935–1939.

During the first half of 1940 the Commission released Parts 2 and 3 of Chapter Six, Part III, of its report on investment trusts and investment companies, dealing with "Accounting Practices and Reports to Stockholders Generally—Accounting Practices of United Founders Corporation Group of Companies with a Description of Their Activities" and a special report on "Fixed and Semi-Fixed Investment Trusts."

[1] The industries covered by these three volumes are as follows: 1. Agricultural Machinery and Tractors; 2. Automobiles; 3. Chemicals and Fertilizers; 4. Cigarettes; 5. Containers—Metal and Glass, Including Closures; 6. Meat Packing; 7. Office Machinery and Equipment; 8. Steel; 9. Tires and Other Rubber Products; 10. Aircraft and Aircraft Equipment; 11. Non-Ferrous Metals and Their Products, Including Smelting and Refining; 12. Oil Refiners and Distributors with Producing Facilities; 13. Chain Grocery and Food Stores; 14. Chain Variety Stores; 15. Dairy Products; 16. Department Stores; 17. Mail Order Houses; 18. Motion Picture Producers and Distributors; 19. Distilled Beverages; 20. Paints and Varnishes; 21. Vegetable Oil; 22. Drugs and Medicines; 23. Toilet Preparations and Soap; 24. Cement; 25. Clay Products; 26. Building Materials Other than Clay Products and Cement; 27. Building Equipment. (Nos. 1 to 9, from Volume I; 10 to 17, Volume II; 19 to 27, Volume III.)

Bureau of Foreign and Domestic Commerce

Among the studies now in progress is one relating to foreign investments in the United States as of 1937, 1938, and 1939. This report will bring up to date and amplify the statistics on the foreign investments in this country which appeared in "Foreign Investments in the United States," a pioneer study published in 1937. In connection with preparation of the annual reports on the balance of international payments of the United States, long-range studies of particular types of international transactions have been undertaken, among which may be mentioned personal remittances and contributions made abroad, and international freight and shipping payments.

In order to meet the need for prompt and detailed analysis of the current foreign trade movement under war conditions, a number of special statistical reports have been issued. These included an analysis of "Exports during the First Six Months of the War," a supplemental report on "United States Trade with Twenty Latin American Republics during the First Six Months of the War," and twenty-two analytical summaries of the trade data for individual foreign countries or trading areas. An extensive report, based upon a field study, on comparative price policy in the domestic and export market, was completed and submitted to the Temporary National Economic Committee as one of the series prepared by the Bureau of Foreign and Domestic Commerce for that Committee.

Studies of the volume of debt outstanding in the United States, carried on since the publication of the Bureau's first report on this subject in 1937, have resulted in the development of altered concepts, and a new series of estimates. The preliminary summary of findings was published in the June 1940 *Survey of Current Business*, and a more detailed analysis is now in preparation.

Two reports of the Bureau of timely interest are the 1940 *Biennial Statistical Supplement* to the *Survey of Current Business*, which presents an historical summary of more than 2,400 current time series brought up through 1939, and the complementary volume on *Sources of Regional Current Trade Statistics*, which records the available current regional series and the sources from which they may be obtained.

The monthly industry survey (to which reference was made in the June issue of this JOURNAL) included in preliminary form in the May issue a monthly index of new orders received by manufacturers. Indexes were presented separately for total manufacturing, for durable and nondurable goods, and for selected industry groups, including iron and steel and machinery. The index covers the period beginning January 1939. Similar indexes providing data on manufacturers' inventory holdings and shipments will be included in the monthly report.

To facilitate the contact of business men with the agencies handling procurement under the National Defense Program, the Bureau, with the cooperation of the War and Navy Departments, issued a circular on National

Defense Procurement. This included a list of the field procurement and purchasing offices of the War and Navy Departments, maps showing field areas of the various army services and 27 Navy purchasing offices, and a partial list of materials being purchased by these agencies.

United States Tariff Commission

Among the reports issued by the Tariff Commission in recent months are the following: Silverware; Trade of Latin America with the World and with the United States; Reference Manual of Latin American Commercial Treaties; Preliminary Report on the United States Production of Snythetic Organic Chemicals, 1939; and War-time Increase in Transportation Costs of Principal Imports.

The first report in the list is a survey of the silverware industry in the United States and in the other principal producing countries. It is the latest in the Commission's survey series covering various industries.

The second report in the list is the first part of a comprehensive report on the foreign trade of Latin America. The parts of this report to be published later will deal with the commercial policies of each of the Latin American countries and with the economic and trade aspects of about 30 principal export commodities of Latin America.

Reference was made in the June issue of this JOURNAL to the Commission's series on *Reciprocal Trade Agreements and Various Industries*, in which seven reports had been issued. Eight additional reports have now been issued, covering the following: Cement and Concrete Products, Fishery Products, Fruit and Fruit Products, Vegetables and Vegetable Products, Alcoholic Beverages, Leather, Leather Footwear, and Grain and Grain Products.

Bureau of Mines, U. S. Department of the Interior

The Economics and Statistics Branch of the Bureau of Mines, working through E. W. Pehrson, Acting Chief, has occupied a prominent position in the development of statistics relating to the raw materials procurement program of the Advisory Commission to the Council of National Defense. For several weeks at the beginning of the work, Dr. C. K. Leith, consultant on minerals to E. R. Stettinius, Jr., occupied quarters in the Bureau of Mines and although his staff is now housed in the Munitions Building the close coordination continues. The Bureau, at the request of the Army and Navy Munitions Board, inaugurated monthly canvasses of production, stocks, and consumption of certain of the strategic minerals as early as September 1939. These reports cover manganese, tin, chromium, tungsten, and mercury. In addition to this current reporting, special inquiries on iron and steel scrap, aviation gasoline, mica, and asbestos have been made. A request for additional funds to develop a completely-rounded statistical program relating to minerals essential to National Defense is now awaiting approval of the Congress. If this money becomes available the resultant expansion will require additional technical and clerical personnel, particularly on metals.

Dr. R. R. Sayers represents the Bureau on the Defense Resources Committee of the Department of the Interior. This group has been organized under the chairmanship of E. K. Burlew, First Assistant Secretary, to expedite contacts between personnel of the Interior Department and the Defense Commission and to facilitate exchange of information. Dr. Sayers specifically is to handle requests of the Commission for information on "mineral production, metallurgy, gas and anti-gas defense, explosives, helium, and related subjects."

H. Herbert Hughes has been loaned to the Bureau of Research and Statistics of the Defense Commission to work on problems relating to minerals and to serve as liaison with the Department of the Interior.

Copy for *Minerals Yearbook*, 1940, was completed and submitted to the printer early in July, somewhat later than in previous years. Because of the congestion of work in the Government Printing Office it is impossible to state when the volume will become available but it may be even later than last year's release date of September 14.

Bureau of Labor Statistics, U. S. Department of Labor

During the last week in June the Bureau conducted two conferences one with State labor statisticians from the States with which the Bureau has cooperative statistical arrangements, and the other with the research workers of national and international labor unions that have set up research departments. The State statisticians were concerned primarily with employment and payroll statistics.[1] The union research workers dealt with a wide range a statistics important in union work. A permanent committee resulted from this conference to act in an advisory capacity with the Bureau.[2]

The principal developments in the field of employment and payrolls are the setting up of an enlarged research unit within the division. A project has been largely completed for bringing into the manufacturing sample all firms with one hundred or more employees. The estimates of total nonagricultural employment have been revised and a new series of State estimates initiated.

Wages and hours studies in process subsequent to those announced in the March issue of the JOURNAL are carpets and rugs, lamps and lamp shades, drugs and toiletries, and jewelry. A study is being made of entrance rates of pay of common laborers in 20 industries, as of July 1940.

The Division of Industrial Relations published in the May *Monthly Labor Review* the report on strikes in 1939. A special analysis is being undertaken of the number of employees "exposed" to strikes over a period of several years

[1] For a complete summary concerning this conference see p. 518.

[2] The membership of this committee is as follows: Florence Thorne, American Federation of Labor, Marion Hedges, International Brotherhood of Electrical Workers, David Kaplan, International Association of Machinists, Lazare Teper, International Ladies' Garment Workers' Union, Ralph Hetzel, Congress of Industrial Organizations, Gladys Dickason, Amalgamated Clothing Workers of America, Harold Ruttenberg, Steel Workers Organizing Committee, Solomon Barkin, Textile Workers Union of America, and Harry Arries, Brotherhood of Locomotive Firemen and Enginemen.

as compared with the number involved in strikes in the country as a whole and for specified industries. Publication is expected in the fall. A bulletin is in preparation presenting a study of the provisions in 7,000 union agreements concerning such subjects as seniority, apprenticeship, closed shop, grievance, adjustment and arbitration. Collective bargaining procedures will be described. A study is being made of vacation plans under collective bargaining agreements with special reference to paid vacations. Trade agreements in defense industries will be summarized for aircraft in the August *Monthly Labor Review* and for ship-building in September, with other industries to follow. Working conditions on night shifts, of particular importance in defense industries, are being studied with special reference to the provisions of the trade agreements. The 1940 survey of union scales of wages and hours is under way. It will have a coverage of 72 cities for the following trades: building trades, bakery trades, printing trades, truck driving, city streetcar and bus operations.

Turnover rates are now published for 36 manufacturing industries. Recent additions are agriculture implements, dyeing and finishing of textiles, and brass, bronze, and copper products.

Under the direction of the chief of the Wholesale Price Division and the immediate supervision of Walter G. Keim, a New York State Works Project is carrying out a regrouping of the commodities included in the wholesale price index, using several different criteria as a basis for the calculations. Technical assistance is being given by a committee of the Price Conference of the National Bureau of Economic Research, and a committee of the Central Statistical Board composed of representatives of interested Government agencies. The project is authorized for a period of a year beginning May 29, 1940.

In the Retail Price Division a history of the rent index work from 1889 to date is being prepared, together with a similar detailed study of the new specifications for rents and the differences in rentals accompanying differences of types of structure, number of rooms, age of building, principal exterior material, etc. A study is being made of the cost of health and accident insurance.

The Bureau of Labor Statistics is collaborating with the Puerto Rican Work Projects Administration and the Insular Department of Labor in making plans for a study of income and expenditures of families of wage earners in Puerto Rico. Miss Alice Hanson, the Assistant Chief of the Cost of Living Division of the Bureau, has spent a month in the island working with a Technical Committee representing the Insular Department of Labor, the Agricultural Experiment Station, Agricultural Extension Service, the Department of Health, the Department of Economics and the School of Business of the University of Puerto Rico, on the schedule and sampling methods to be used in the study.

Current summaries by the Labor Law Information Division have to do with (1) labor legislation enacted by the Federal Government and the vari-

ous States during 1939 and 1940 (2) a compilation of Federal and State laws on arbitration, mediation and conciliation, including any anti-injunction and anti-union laws, (3) summaries of laws regulating hours, wages and working conditions, (4) legislation concerning labor relations, (5) Federal legislation affecting railroad employees, (6) analyses of both Federal and State court decisions.

Women's Bureau, U. S. Department of Labor

The Women's Bureau will soon have available a study showing the economic condition of families in which women work. The study is based on personal interviews with women in the various occupations in Cleveland and in the State of Utah. It will represent a cross-section view of the earnings and the contribution to family support of women in the several age groups and of single and married women as contrasted with the earnings of the men of the family and their contribution. The report will show also the educational background and experience which have led to the present position which the woman holds.

A survey of wages and hours in the service establishments of Maryland has been completed. This will show earnings of both men and women in Baltimore and a representative number of towns of different sizes in Maryland.

Alien Registration

As part of the National Defense program, a nationwide registration of aliens will be conducted from August 27 through December 26, 1940, by the Immigration and Naturalization Service of the Department of Justice. Registration will take place in the post offices of the nation. It is expected that more than three and one-half million aliens will be registered during the four-month period.

Registration is made compulsory by a specific act of Congress, the Alien Registration Act of 1940, which requires all non-citizens to register during the four-month official registration period. The law requires that all aliens 14 years or older are to be registered and fingerprinted. Alien children under 14 years of age will be registered by their parents or guardians. When alien children reach their fourteenth birthday, they will be required to register in person and be fingerprinted.

A fine of $1,000 and imprisonment of six months is prescribed by the Alien Registration Act for failure to register, for refusal to be fingerprinted, or for making registration statements known to be false.

As part of its educational program to acquaint non-citizens with the registration requirements, the Alien Registration Division is distributing more than five million specimen forms listing the questions that will be asked of aliens at registration time. Besides the usual questions for establishing identification, the questionnaire asks the alien to tell how and when he entered the country, the method of transportation he used to get here, and the name of the vessel on which he arrived.

He is also asked to state the length of time he has been in this country and the length of time he expects to stay. He must also describe any military or naval service he has had, and list the names of any organizations, clubs, or societies in which he participates or holds membership. In addition, he is required to describe his activities in any organization, and to affirm whether or not the organization furthers the interests or program of a foreign government.

To make their registration easier, aliens are being asked to fill out sample forms, which will be available prior to registration, and take them to post offices where they will be registered and fingerprinted. Every registered alien will receive by mail a receipt card which serves as evidence of his registration. Following registration, the Act requires all aliens, as well as parents or guardians of alien children, to report changes of residence address within five days of the change.

The register will be maintained as a current file. All aliens entering the United States will bring with them their fingerprinted registration cards issued by the United States Consul in the country from which they come. These cards will be added to the register. The records of all aliens who are naturalized will be withdrawn from the file at the time of their naturalization. Procedures will also be established to remove the records of aliens who have died and to establish periodic checks. For purposes of statistical tabulation punch cards will be prepared carrying most of the information that is recorded on the registration forms.

The Alien Registration Act was passed so that the United States Government may determine exactly how many aliens there are, who they are, and where they are. Both President Roosevelt and Solicitor General Biddle have pointed out that registration and fingerprinting will not be harmful to law-abiding aliens. The Act provides that all records be kept secret and confidential. They will be available only to persons approved by the Attorney General of the United States.

Bureau of Research and Statistics, Social Security Board

In order to make adjustments for the changing needs of the research and statistics program of the Social Security Board, the structure and organization of the Bureau of Research and Statistics were reoriented effective at the beginning of the fiscal year. The reorganization gives formal effect to the termination of much of the work which was formerly part of the Bureau's program and is now done by statistical and research units in the operating bureaus of the Board. At the same time the new organization provides for the strengthening of other functions and makes formal provision for the more effective development of coordination in the research and statistics activities among the bureaus of the Board and between the Board and other Federal agencies administering closely related programs. The divisional organization of the Bureau beginning with the present fiscal year follows:

Office of the Director
Division of Finance and Economic Studies
Division of Coordinated Statistics
Division of Public Assistance Research
Division of Health and Disability Studies
Division of Publications and Review

Under the reorganization plan the Division of Old-Age Benefits Research and the Division of Economic Studies were merged into a new division, the Division of Finance and Economic Studies. The studies carried on previously in the two divisions will be continued in the new division.

A comprehensive revision of a previous publication, *The Fiscal Capacity of the States: A Source Book*, was initiated during June and is expected to be completed by fall. In addition to adding more recent data to those now included in this publication, it is planned to incorporate several new types of material. The publication is designed to bring together background material bearing on the fiscal position of the various States, with special reference to the varying financial and economic resources available for the financing of social security programs. The State revenue series presented in the previous issue will be brought down to the most recent date possible with the use of both primary and secondary sources. A considerable number of quantitative relationships between the tax systems of the States and their outlays for welfare services will be developed together with collateral data on the economic characteristics of the States, Federal grants-in-aid received by the States, and other pertinent items.

The Division of Health and Disability Studies (formerly the Division of Health Studies) has been engaged in a new and more extensive estimate of the costs of proposed disability insurance programs providing for compensation for permanent and total disability, with a benefit structure analogous to that now used for old-age and survivors insurance. Incidental to this estimate, more extensive analyses have been made of permanent total disability rates both in the United States and abroad.

A study of the economic status of the aged is nearing completion. A report on the experience of commercial insurance with income benefits for total and permanent disability has been completed. Attention is directed to the bearing of commercial experience on the insurance of permanent disability or invalidity in a social insurance system.

The possibility of setting up a plan for statistical reporting of the nature and frequency of services given by certain prepayment medical organizations to their members and days of disability experienced by the members of these plans has been explored. Schedules have been prepared and a trial study made at the Trinity Hospital Clinic of Little Rock, Arkansas. To date, records have been received and analyzed for April and May of this year.

Data derived from the study of family composition in the United States on the employment status of workers in relation to family structure and income are being analyzed. The findings will appear in the *Social Security Bul-*

letin. An analysis of family structure and income of families with aged heads has been undertaken.

A volume on mental deviations and diseases in relation to economic security is nearing completion. This study deals particularly with negative (i.e., subnormal) deviations. The extent of mental deviations is explored and a study is made of their distribution in terms of socio-economic setting, natio-racial groups, age and sex, and urban and rural backgrounds. The question of hereditary and environment factors in relation to mental deviation is considered. Attention is given to the potential increase in the number of mental deviants and its effect on our social and economic institutions. Present provisions and unmet needs of mental deviants are reviewed and evaluated. Other subjects considered in the study include mental deviation as a factor in unemployment.

The publication of a *Yearbook* as an annual supplement to the *Social Security Bulletin* has been inaugurated. The publication will summarize on a calendar-year basis significant data derived from the operation of the social security program, such as those arising from wage records under the old-age and survivors insurance program; employment and pay-roll reports from the old-age and survivors insurance program and the employment security program; and legislative, financial, or social data available for all programs. The first issue will be off the press early in the fall.

The study on *Cash Benefits Under Voluntary Disability Insurance in the United States* has been completed and is now in press.

The report entitled *Old-Age in Sweden: A Program of Social Security* is also in press. The report constitutes a comprehensive analysis of the coverage, contributions, and benefits under the Swedish contributory old-age insurance program and of the relation of that program to the provisions for noncontributory payments (supplementary pensions) administered on a needs basis. Other public provisions for the aged in Sweden are also summarized.

Other studies which are now at the printing office are *Public and Private Aid in 116 Areas* and *Trends in Public Assistance, 1933–39*. The monograph on *Public and Private Aid in 116 Areas* brings together in revised form data heretofore published by the Children's Bureau of the United States Department of Labor and by the Social Security Board. It provides a record of public and private relief extending over a longer period of time than any other comprehensive series of relief statistics.

The report on *Trends in Public Assistance, 1933–39* gives a tabular summary for the continental United States of payments under public assistance and general relief programs and earnings under Federal work programs from 1933–39 and of recipients of public assistance, cases receiving general relief, and persons employed under Federal work programs over the same period. Data on public assistance and general relief are given by States for each of the four years, 1935–39, and by States and counties for December 1939.

Announcement of the release of these publications will be made in the *Social Security Bulletin*.

Research and Statistics Division, Bureau of Employment Security, Social Security Board

Increased responsibility of the public employment service for meeting labor requirements of the industrial defense program as well as informational needs of other agencies have necessitated an expansion in the statistical reporting program in those respects bearing on current labor market developments. As a result, additions have been made to the regular reports that will be received by the Social Security Board from the State employment security agencies. All of the reports are designed to yield information on the availability of labor in certain occupations that are essential to the defense industries.

One of the unique features of the new reports is that they will be made for each local employment office, thus providing information on local areas which has heretofore not been available at the Federal level. Among these occupational reports is one dealing with canceled job openings, by reason for cancellation, and another on job openings pending more than one week, which are intended to furnish rough indications of the areas and occupations in which labor stringencies are developing. A third report will be made on the number of registrants actively seeking jobs who are qualified to work in selected key occupations. These three reports will be supplemented by a weekly narrative summary of developments in local labor markets which will point out changes in the demand for and the supply of labor and other developments having a relationship to labor requirements of the defense program.

Consideration is being given to the revision of the employer visiting schedule used by public employment offices to obtain information regarding anticipated labor requirements. This report, it is expected, will be submitted to Washington for employers in important defense industries. Arrangements were made in cooperation with the Employment Service Division for facilitating the clearance of job openings across State lines in those instances where required labor is not available in local communities. Finally, as part of the arrangements that have been made with the Civil Service Commission, reports will become available on the service performed by public employment offices in supplying labor for government shipyards and arsenals.

The demand for information on the characteristics of the persons registered as active job seekers at employment offices necessitated the release during June and July of several preliminary summary tabulations of the April 1940 inventory. Additional releases are expected to be made available on the basis of more detailed tabulations showing for each State and selected communities, occupation, industry, age, sex, and color, of persons registered as actively seeking work during April 1940. Until the tabulations are available from the 1940 census, the inventory data will represent the most comprehensive series of information on characteristics of job seekers.

Arrangements have been made with the State employment security agencies for submittal of the annual report on employment and pay rolls cov-

ered by the respective State unemployment compensation laws in 1939. A series of staggered due dates has been established and the last of the reports will be due August 15. It is hoped to complete editing and tabulation by November 1, and publication of the data by the end of the year. During the second quarter of the year, reports on employment and pay rolls were received for the first quarter of 1940, based on the new method of reporting these data for identical firms. Reports are being edited and as 1939 benchmark material becomes available, it is expected that release of the information will be made for each State for each major industry group in the Social Security Board Industrial Classification Code. There has been a widespread demand for the publication *Employment and Pay Rolls in State Unemployment Compensation Systems, 1938* issued in April. Requests for the information were received from private business organizations, labor organizations, Federal agencies, and a variety of other sources. The original supply has been exhausted, and a second run is being made at the present time.

Further progress was made on the study of the adequacy of unemployment compensation in Wayne County, Michigan, and plans have been made for an analysis of data collected in selected Wisconsin counties, bearing on the same subject. Attention has also been given to the effect of the amendments to the Social Security Act, with respect to certain types of agricultural labor exclusions.

Bureau of Old-Age and Survivors Insurance, Social Security Board

Final tables have been prepared showing for 1938 the number of employees in the industries covered by Old-Age and Survivors Insurance, their 1938 and their cumulative taxable wages, and the number of quarters in 1938 during which such wages were earned, by age, sex, race, State of employment, industry, and intervals of 1938 earnings. A handbook of 300 pages, entitled *Old-Age and Survivors Insurance Statistics, Wages and Employment of Covered Employees, 1938,* which is in course of preparation, will contain these tables in full, with selected 1937 data for comparison. The handbook is designed primarily for the use of Government agencies, university and public libraries, and economic and social foundations, associations and institutions. Persons desirous of obtaining it should address Mr. John J. Corson, Director, Bureau of Old-Age and Survivors Insurance, Social Security Board, Washington, D. C.

Division of Research, Work Projects Administration

Special Reports on the Labor Market. In cooperation with the Committee on National Relief Policy of the National Resources Planning Board, a series of special reports has been prepared on the following subjects: The Characteristics of the Labor Supply; Monthly Variations in Employment; Unemployment and the Labor Force; the Younger Worker; The Older Worker; and Depressed Areas. It is planned to issue these reports as part of a special research bulletin series of the Division.

Youth Studies. A special research bulletin entitled *Disadvantaged Youth on the Labor Market* has been prepared at the request of the American Youth Commission. This report reviews the difficulties in finding jobs experienced by the most disadvantaged 10 per cent of labor market youth, selected on the basis of duration of unemployment relative to total time in the market. Features distinguishing the disadvantaged from the more fortunate young workers are also discussed.

The sixth pamphlet in the Social Problems series, entitled *Thirty Thousand Urban Youth*, is in process of publication. Employment status of the 30,000 youth, selected at random from eighth grade graduation lists of 1929, 1931, and 1933 in seven cities is reported as of July 1938. The gradual improvement in status from the youngest to the oldest class is pointed out, along with differential factors appearing to affect youth's success.

Migratory Workers. A special report, *Mexican Migratory Workers of South Texas*, is now in press. This study was undertaken to supply information on the economic status of a large but little-known group of migratory farm workers. Crystal City, Texas, was chosen for the field work because the Mexicans there combine summer work in sugar beets and cotton with winter work in spinach and other south Texas vegetable crops. A representative sample of 300 families was interviewed.

A Survey of Relief and Security Programs. The primary purpose of this survey is to outline the major trends and developments in the field of relief during the last decade, in order to give the perspective necessary to an understanding of the relief problem. Relief administration prior to 1933, or the background period from which Federal grants for relief emerged in 1933 is described. A comprehensive account of the work of the FERA, CWA, and the highly significant developments of 1935 is given; the aims and policies of Federal relief and security programs from 1935 up to the present time are described. The report will amplify and bring up to date the material presented in *A Survey of Relief and Security Programs* published in May 1938 by the Works Progress Administration.

The Status of Housing in the United States. A report on the status of housing in the United States has been prepared for the Temporary National Economic Committee. This report shows the economic problems affecting housing and the deterrents to the maximum operation of the industrial units that go to make up the housing industry. Among the subjects discussed are volume of construction; relationship of residential to total construction; market factors affecting residential building, such as income, rents, population growth, etc.; how the building industry operates: housing finance, technical trends, taxes, building codes, and public housing.

Division of Statistics, Work Projects Administration

The Work Projects Administration has established a National Defense Training Project sponsored by the Advisory Commission to the Council of National Defense and co-sponsored by the United States Office of Education

in order to provide workers trained in occupations needed for national defense. The Division of Statistics is currently collecting data on employment on these projects and information will be available on the number of workers completing the several training courses offered.

United States Office of Education

The collection of data for the Biennial Survey of Education, 1938–40 which is based on the school year ending in June, 1940, is well under way. The statistical forms have been mailed to city school systems, public and private residential schools for exceptional children, and colleges and universities.

The survey for 1938–40 includes a salary schedule for persons employed on the instructional staff in colleges, a special report for training schools for nurses, and a special report for college and university libraries.

During the summer the report forms will be sent to the 48 State departments for the biennial report for the public school system.

Dominion Bureau of Statistics, Canada

Demography. Volume 2 of the Saskatchewan Census of 1936 has been published. It gives statistics of occupations, unemployment, earnings and employment, households and families.

National Registration. A National Registration of all residents of Canada between 16 and 65 years of age, of both sexes, will be taken in August for the purpose of the more efficient carrying on of Canada's effort in the war. The questionnaire will include enquiries as to age and conjugal condition, dependents, country of birth, nationality and racial origin, education and health, occupation, employment and previous experience in defence services. Both men and women are asked special questions relative to farming experience.

Registration under the Act is compulsory, and registrants will be furnished with identification cards which they may be called upon to produce at any time. The total number of registrants is estimated at approximately seven million persons. Persons attaining the minimum age of sixteen years after the date of the registration are required to register as soon as they reach that age. The Dominion Bureau of Statistics was consulted in the framing of the questionnaire and the results of the registration will be compiled on its machines, while a special staff of some 500 clerks will be engaged in punching cards from the questionnaires received.

Forestry Statistics. The monthly report on domestic shipments of rigid wallboard has been discontinued.

External Trade Statistics. The "Monthly Report on the Trade of Canada" has been discontinued, at least temporarily.

Internal Trade Statistics. The Bureau's cost of living index is in the final stages of a complete revision in which changes have been made both in the list of items included and in the weights used. The latter have been based up-

on budget records furnished by 1,436 Canadian wage-earner families in twelve representative cities, and the forms completed by these families were drafted so as to provide a maximum of useful data for index weighting purposes. Survey records covered the year ending September 30, 1938. The revised index will be computed monthly dating from January, 1935.

Municipal Finance Statistics. A conference on municipal statistics, looking to the improvement of municipal accounting and to the establishment of uniformity throughout Canada in reporting on municipal affairs, was held with representatives of the provincial governments and of municipal bodies on May 6–9. Reports of committees appointed at the previous conference in 1937 were discussed and generally approved, final endorsation of the new system in its totality being reserved for a further meeting in the autumn. Economy and efficiency in municipal administration will, it is felt, be promoted by the adoption of the new plan of municipal accounting.

Dun & Bradstreet, Inc.

Survey of Business Opinion Regarding Accounting Practices. A high percentage of questionnaires have been returned by accountants, credit men, bankers, and corporation treasurers in connection with the study of financial statement concepts and practices beng made under the direction of Roy A. Foulke. Opinions and comments as to the presentation of consolidated statements, verification of inventories and receivables, the responsibility of accountants to directors, stock-holders and the public will be summarized in a report to be published in the late fall.

Financial Ratio Studies. Mr. Foulke is also bringing up to date the series of financial ratios which originally appeared in 1935 in his book *Behind the Scenes of Business.* Typical financial ratios for 1939 are being assembled and will be included in a new pamphlet by Mr. Foulke, scheduled for publication before the end of this year.

Municipal Finance Studies. The Municipal Service Department, under the direction of Dr. F. L. Bird, has in preparation three special studies, planned for publication this fall. The first, *The Credit of the City of New York,* will give special attention to the city's revenue system, pension system, financing of unemployment relief and integration of its subway systems under municipal ownership. The second will be a comparative study of the credit of New Jersey municipalities. A third will cover the finances, financial policies and rates of municipally-owned water systems in one hundred large cities.

Economic Appraisal of Defense Program. An economic appraisal of special aspects of the Defense Program is providing the material for a series of articles by Edwin B. George for publication in *Dun's Review.* The first article will appear in the August issue and will deal with the Procurement Organization of the Federal Government, together with the modifications and adaptations being made for the purpose of forwarding the rearmament effort. A later article will inquire into the economic significance of the choices necessarily being made in Washington among the various available methods

of financing plan expansion. Attention will also be paid to the problem, almost physical in some of its manifestations, of actually spending the huge sums of money involved without dislocating the existing economy. A corollary is whether to attempt making positive use of expenditures as a means of redressing existing dislocation.

Subsequent articles will endeavor to follow the actual development of the Defense Program with respect to orders placed by localities and types of merchandise, with appropriate consideration of economic consequences.

Survey of Retail Operating Costs. Costs and profits of retail stores in 1939 are being surveyed under the direction of Walter Mitchell, Jr. Gross margin, inventory turnover, and detailed expenses expressed as percentages of sales are presented in the Survey. Wherever possible, stores have been grouped for tabulation by profit status, size of town, region and sales volume.

More than 60 lines of retail trade are represented in the Survey, and individual reports carrying the results for each trade are being published. These individual trade reports will, as previously, be consolidated into a bound volume. In addition, small bound volumes will be available containing the results for groups of related and allied trades as follows: Food Group, General Merchandise and Apparel Group, Furniture and House Furnishings Group, Building Materials and Hardware Group, and Automotive Group.

In previous years copies of the Survey reports were distributed without charge to interested parties. This year it has been necessary to place a nominal charge on the Survey reports to cover their cost.

The results embody correspondence and numerous conferences with retailers and with manufacturers and wholesalers who have conducted retailers' "clinics."

Every effort has been made to make the results both practical and easy for the retailer to use in applying them to his own business.

The survey has four main parts:

(1) A general statement as to the Survey's purpose, usefulness, and limitations,
(2) Definitions of terms used,
(3) Tabulations of survey data and a brief summary of their significance,
(4) Instructions for putting the survey figures to work, and a work sheet on which the retailer can enter his figures for convenient comparison with the survey averages.

CHAPTER ACTIVITIES

The Albany Chapter

An exceedingly interesting and illuminating moving picture, billed on the program as "Behind the Scenes of the 1940 Census," was presented at a dinner meeting of the Albany Chapter on June 6, attended by about 25 members and guests. Action shots showing enumerators in the field at work on the population, agricultural, and housing schedules were included. Arrangements for the sound film had been made by Dr. Schneider, Chairman of the Program Committee, as a sequel to the previous meeting on the 1940 Census, addressed by H. H. McClure, Executive Assistant, U. S. Bureau of the Census.

The following officers were elected for the coming year: President, David M. Schneider, New York State Department of Social Welfare; Vice-President, Edward H. Van Winkle, Rensselaer Polytechnic Institute; Secretary-Treasurer, Ruth I. Carlson, Division of Placement and Unemployment Insurance, New York State Department of Labor; Directors, Roland F. Bucknam, New York State Public Service Commission, and Ralph E. Wareham, General Electric Company.

The Austin, Texas, Chapter

The Austin Chapter held its final meeting of the session on May 29, 1940. The officers were reelected to serve for another session. F. A. Buechel and Edward Dedeke, of the Bureau of Business Research, presented a discussion of "Family Budgets and Consumer Habits and Preferences." This discussion was based on data recently collected in Texas cities. The importance of these studies and the methods used in collecting and tabulating the data were emphasized. The results of these studies have recently been published by the Bureau of Business Research in a volume entitled, *Preliminary Consumer Report on Family Budgets and Per Capita Consumption of Staple Articles of Food*. Much interest was manifested by members present on account of the promise these studies hold for throwing light on the demand for various classes of consumers' goods.

The Cleveland Chapter

The thirteenth annual meeting of the Cleveland Chapter was held on May 9, 1940. Seventy-five members and guests were present. Mrs. Frida F. Selbert, President of the Chapter, presided.

John W. Love, Chairman of the Nominating Committee, presented the following nominations for officers for 1940–41: K. H. MacKenzie, President; J. W. Vanden Bosch, Vice-President; and E. A. Stephen, Secretary.

Three papers were presented at the meeting. Edward A. Stephen, of The Ohio Bell Telephone Company, spoke on the methods used and the results

obtained in a clerical wage survey conducted by the Telephone Company in its major operating cities in 1939.

Miss L. Jane Du Brul of Cincinnati presented a paper on "A Statistical Approach to Stock Selection." Miss Du Brul's method centered around the ratio of an index of highly volatile stocks to the general market averages. The speaker used display charts to illustrate how the ratio tended to forecast the general movement of the stock market.

Leonard P. Ayres, Vice-President of the Cleveland Trust Company, was the final speaker. To illustrate his talk, Col. Ayres distributed a booklet of diagrams reproduced from his recently published book entitled *Turning Points in Business Cycles*, also the subject of the talk.

The group was fortunate to have Chas. J. Stilwell, President of The Warner Swasey Company, give his comments on the papers.

The Columbus Chapter

At the meeting on February 21, 1940, A. R. Mangus discussed the subject of "Delineation and Description of the Rural Regions of the United States."

It was found by the Federal Emergency Relief Administration, when it began to function in 1933, that the intensity of distress varied greatly in different parts of the country, thus showing a decided regional aspect. Relief intensity rates were found to be associated with a complex of social, economic and demographic factors. Patterns of such factors were used to delineate the rural regions and subregions of the United States. The methods used in delimiting and describing these regions and subregions were described by Dr. Mangus. Eleven variables were selected for delineating rural-farm regions and subregions.

Twenty recognized type-of-farming areas were adopted tentatively for delineating cultural subregions. Within each area subregions were determined according to the following method:

First approximation to subregions. (a) The two county indices considered most pertinent, rural plane of living and population-fertility ratio, were converted into percentile scores based on the ranking of counties within the tentative areas. These rank scores were written in each county on a large outline map. (b) Careful examination of the geographical distribution of scores was made to find centers of relatively small variation. Lines were drawn around such centers following lines of clear demarcation between counties, that is, lines of sharp differences between counties with respect to percentile ranks.

Second approximation. When the groups of contiguous counties resulting from the first approximation to subregions had been segregated, they were classified into frequency distributions with respect to each of the several factors selected for use in rural-farm regionalization. For each distribution, the median and average deviation was computed. For each index, geographically contiguous groups of counties were compared with respect to corresponding medians and deviations. Those adjacent groups

that did not differ in important respects from each other on any index were then combined.

Final approximation. Medians and average deviations were again computed for each group of counties resulting from the second approximation using the same indices. For each county whose subregional allocation was in question, computations were made to determine its total percentage of variability from the median of each subunit to which it might possibly be assigned. On the basis of this computation, it was assigned to that subunit from which it varied least. The application of this procedure resulted in 218 subregions.

Final regions. For each subregion, the median county with respect to the factors used in the differentiation was found. Using these subregions as new units, they were grouped into 32 major regions according to their similarity with respect to the several social factors used in the study.

After the rural-farm regionalization was completed, similar regionalization was undertaken on the basis of rural non-farm elements. Having determined the borders of rural-industrial regions and their relation to those of the original rural-farm regions, adjustments were made to reconcile the discrepancies between the two sets of regional boundaries and to institute a consistent set of rural regions combining the farm and non-farm elements. This process of rural regionalization resulted in 34 major rural regions.

Lester S. Kellogg talked on "The Research Resources and the Current Program of the Ohio State Bureau of Business Research" at the meeting on March 20.

The major research resource of the Bureau of Business Research of Ohio State University lies in its capacity to integrate the efforts of business people, students, and professional personnel, and in its relationship to those agencies, on both national and local plane, which collect data either as their major objective or coincidentally to their major objective. Although this may be its main resource, there are many others in a Bureau of this sort, which arise out of its experience and productive history.

Because of the nature of the resource with which it operates, the Bureau of Business Research of Ohio State University has a varied program involving pure research projects, teaching and training programs, cooperative relationships on research programs with other educational agencies, as well as servicing functions through the provision of regularly collected and compiled data, mainly to the people of the State. The nature of the relationship involved in this type of program indicates that such a Bureau must operate on on funds provided in a variety of ways. However, the main support must be provided by Ohio State University.

In order fully to carry out its function, and in recognition of the fact the scope of activity in private enterprise and the State has broadened, it has become necessary to depend more and more upon detailed economic and statistical facts concerning our business life, the Bureau must set for itself a high level of aims in the future.

1. Such a Bureau should be equipped and organized for conducting research projects of state-wide social and economic interest.
2. Such a Bureau ought to have trained personnel, experienced in business sympathetic to the problems in business and government, willing and able to undertake researches in them, and to aid in guiding those businessmen who do not have facilities for doing their own research.
3. The Bureau of Business Research should have relationships so integrated in the teaching and training program of the College that students will have the benefit of working on *actual* problems and will learn the general character of the scientific approach to business problems.
4. In the future the Bureau of Business Research should, through its extension activities at the secondary school level, adjust its program so that it may aid in the training of students.
5. A Bureau of Business Research properly equipped should be a clearing house for statistical methods and data for the area in which it operates.
6. Last, the Bureau of Business Research as an agency ought to be able to raise questions concerning movements of economic forces and the direction of business trends with confidence that subversive activities are not thereby being fostered.

On April 17, Clifford L. James talked on "Statistical Problems in Measuring the Effects of the Reciprocal Trade Agreement Program."

The problems of measuring statistically any improvements which may have occurred in the foreign trade of the United States because of the introduction of reciprocal trade agreements is most difficult because of the diversity of the terms of the agreements and the products which are covered by them. The lack of comparable data before and after such agreements, makes it impossible to evaluate changes even if other variables might be held constant. "The most favored nation" clauses of our trade agreements have increased the difficulties of statistical measurement. For instance, if changes were introduced between the United States and only one nation, the resulting effects might be measured, but since other nations receive any benefits which may be granted to one nation, simultaneously, the changes effected are not so easily discernible.

Professor James made clear that the problems of exporting products, and the effects of those exports upon our domestic markets are so closely related to our home production problems that the very size of the problem of measuring changes is a major deterrent to effective statistical work.

Basic probably to all of the work of establishing agreements as well as to that of measuring their effects is the determining of the characteristics of the demand curves for the products involved. Without more specific information concerning the nature of our demand functions, it becomes practically impossible to evaluate foreign trade tariffs and subsidies.

A meeting of the Chapter was held on May 15, 1940. The following officers were elected for the coming year: William H. Mautz, President, John N.

Hart, First Vice-President, Viva Boothe, Second Vice-President, and Naomi L. Bowles, Secretary-Treasurer.

Professor Henry E. Hoagland, of the Department of Business Organization, Ohio State University, delivered the address—the subject being "The Statistical Set-Up of the Home Loan Bank Board." Dr. Hoagland, who was a member of the Board for the first three years of its existence, described the history and development of the existing Federal Home Loan Agencies, the first legislation having been set up in 1932 under President Hoover for the supervision of Home Loan Agencies. There have been three groups interested in legislation in this field. The first group has been interested in securing a system of federal mortgage discounting. The second group consisted of bankers who were interested in preventing any such legislation. The third group was the savings and loan faction, the only one which was successful in its aims.

In June, 1933, the Home Owners' Loan Corporation was set up with a lending power of $4,750,000,000, of which $1,250,000,000 has never been used. Its purpose was the financing of distressed home owners, and it was thought in Washington that the very existence of this agency would, to a large extent, stop the surge of home foreclosures without extensive loan operations. The actual result has been, however, that the extent of financing of H.O.L.C. can be visualized only by realizing that about every sixth house in the nation has received help from the H.O.L.C.

A clause, not given much attention when passed, permitted federally chartered savings and loan institutions. However, the practice has become extensive and most savings and loan institutions here in Columbus have converted their charters from State to Federal. A further influence of this clause has been that savings and loan companies which have not secured a Federal charter have adopted most of the policies as set down for the Federal institutions.

In 1935, because the Federal Deposit Insurance Corporation had been so successful in reopening banks, the Federal Savings and Loan Insurance Corporation was organized. This agency, however, insures safety rather than liquidity, as is the case with the F.D.I.C.

In describing the statistical activities of these home financing agencies, Dr. Hoagland pointed out that in the beginning the aim was to secure loans, and there was not much attention given to statistics. Statistically, the main office was in Washington with branch offices in each state. For collection of loans, however, regional offices were set up so that there were 30,000 to 110,000 loans in each. The purpose of statistics at this juncture was for operating purposes only. Later there was set up a Bureau of Statistics and Research, the first stage of this being the organization of the Rehabilitation Division to study the "soft spots" of the country. Out of this came some interesting plans, and the need to know more about the general mortgage picture.

The statistics developed by the H.O.L.C. were of two kinds. The first consisted of control statistics, and these were never given much publicity. Other

statistics which were given wide publicity were for the purpose of promoting acceptance by the public of the facilities being made available.

The Board initiated a series on building costs, and also presents indices of foreclosures, home construction, and home financing in a monthly bulletin of the agency.

The economic effects of these laws, and the policies laid down in their administration, were informally discussed by Dr. Hoagland and other members of the club. He called attention to the value of federal supervision of savings and loan institutions, especially in certain parts of the country where the interest and commission rates had been exorbitantly high, which has not been the case in Ohio. Other phases of the discussion included a probable proportion of loans not repaid, and the disposition of property under such circumstances.

At a meeting of the Executive Council on May 28, the following committees were appointed for the coming year: Program Committee, John H. Sloan, Chairman, Rufus E. Miles, and L. Edwin Smart; Membership Committee, William Papier, Chairman, L. F. Kellogg, Lester S. Kellogg, Ira M. LaMoreaux, A. R. Mangus, Mary Louise Mark, Samuel B. McGavran, Arch D. Schultz, and B. A. Stevens.

The Harrisburg Chapter

The April and May meetings of the local chapter represented a continuation of the series of programs on State Statistics inaugurated last autumn. On April 16, the Research and Statistics Division of the State Department of Welfare sponsored a program on the statistical aspects of state welfare activities in the Commonwealth of Pennsylvania. E. Preston Sharp, Supervisor of Rehabilitation at the Eastern State Penitentiary in Philadelphia, discussed the practical problems involved in this field, with particular emphasis on penal institutions. LeRoy C. Schaeffer, Supervisor of Research and Statistics of the Department of Welfare, spoke briefly concerning the broad aspects of welfare statistics and surveyed the history and administration of each phase in this state.

The general subject of the meeting on May 21 was "Industrial and Financial Statistics," especially dealing with those data pertaining to Pennsylvania which have been collected by the State Department of Internal Affairs. Henry W. Van Pelt, Director of the Bureau of Statistics, discussed the nature and scope of their work and presented in quite detailed fashion a new phase recently instituted concerning municipal finance and taxation.

The Committee on State Statistics has been working on the compilation of a *Source Book of State Statistics* to supplement the *Directory of State Statistical Agencies*, which was prepared and issued during this past year. Replies have been received from all of the cooperating state groups and completed questionnaires are now in the process of being edited and checked by members of the Committee. The material from these will be deposited with the

State Planning Board for permanent reference. The *Source Book* should be ready for distribution late this summer.

The Philadelphia Chapter

At a meeting of the Philadelphia Chapter of the American Statistical Association on May 24, Theodore J. Kreps, Economic Adviser to the Temporary National Economic Committee, discussed the subject, "The Economic and Statistical Studies of the Temporary National Economic Committee."

Dr. Kreps outlined the nature of some of the problems faced in the Committee's investigations and discussed the objectives of the investigations in the light of current and historical developments in various types of business. Consideration was given to the possible different criteria of guides in determination of economic policy, these ultimate motivating concepts being related to different spheres or strata of thought which might be essentially social, political, industrial, or economic. Much of the evening's discussion centered around the broad ideal of an economy of maximum production at minimum prices.

The following officers were elected for 1940–41: President, J. Parker Bursk, University of Pennsylvania; Vice-President, Irwin S. Hoffer, Temple University; and Secretary-Treasurer, Robert R. Williams, of the Federal Reserve Bank of Philadelphia.

The Washington Statistical Society

There were two meetings of the Washington Chapter of the American Statistical Association on May 9, 1940. "Concepts of Net Contribution" was the subject of one of these meetings, with Alan R. Sweezy, Work Projects Administration, acting as chairman. Walter S. Salant, Department of Commerce, discussed "Concepts used in the Dynamic Analysis of Income"; Martin Krost, Federal Reserve Board, discussed the "Net Contribution of Government to Total Expenditures," while Arthur B. Hersey, also of the Federal Reserve Board, took as his subject "Measurements of Gross and Net Outlays of Business Enterprises."

The second meeting was devoted to papers and discussion of "Methods of Adjusting for Seasonal Variations," with Frank M. Weida, George Washington University, acting as chairman. Clarence M. Purves, Bureau of Agricultural Economics, discussed "Seasonal Adjustment Methods in Agriculture"; Maxwell R. Conklin, Federal Reserve Board, spoke on "Seasonal Adjustment Methods of the Federal Reserve Board," while Alexander Sturges, Bureau of Labor Statistics, took as his subject "Uses of Fourier Series in Seasonal Analysis." Both of these meetings were well attended.

On the evening of Monday, May 27, the Washington Chapter held its annual election and the only dinner meeting of the 1939–40 season. It was also the local chapter's celebration of the American Statistical Association's Centennial Anniversary. Murray W. Latimer, Chairman of the Railroad

Retirement Board, was the chairman of the evening, and Mordecai Ezekiel and Morris A. Copeland were the speakers. Mr. Ezekiel, who is Economic Adviser to the Secretary of Agriculture, discussed the "Role of Statistics in Economic Policy," and Mr. Copeland, who is Director of Research, Division of Statistical Standards, discussed "Developing and Coordinating Statistics in the Federal Government."

Frank R. Garfield, Division of Research and Statistics of the Federal Reserve Board, was elected President for the year 1940–41. The other officers are as follows: Vice-President, Floyd J. Hosking, Corn Industries Research Foundation; Members of the Executive Committee, Robert R. Nathan, (retiring President), National Income Division, Bureau of Foreign and Domestic Commerce, and Aryness Joy, Assistant to the Commissioner, Bureau of Labor Statistics; and Secretary, Harold D. Kube, Bureau of the Census.

NOMINATING COMMITTEE

President Hayford has appointed the following members as the Nominating Committee for 1940: Mr. Ralph J. Watkins, National Resources Planning Board, Washington, D. C., *Chairman*, Mr. Henry B. Arthur, Commercial Research Department, Swift & Company, Chicago, Illinois, and Professor Helen M. Walker, Teachers College, Columbia University, 525 West 125th Street, New York City. The report of the Nominating Committee will be published in the November *Bulletin*.

FREDERICK F. STEPHAN, *Secretary*

M. C. MACLEAN

M. C. MacLean, M.A. (Dalhousie), A.M. (Harvard), Chief of Social Analysis in the Dominion Bureau of Statistics, was accidentally drowned at a summer resort near Ottawa on July 12, to the great regret of his colleagues and friends in the Bureau and of all who knew him either personally or through his writings.

MacLean, after spending a number of years in the teaching profession and serving his country in the first World War for four years, was appointed Assistant Chief of Education Statistics in the Dominion Bureau of Statistics in 1919. Some years later he became Chief of the Education Statistics Branch, and in that capacity was responsible over many years for the Bureau's Annual Survey of Education in Canada. In this connection he prepared a Census monograph on "Illiteracy and School Attendance in Canada," based on information collected at the Census of 1921. The excellence of this monograph and MacLean's high mathematical attainments led to his appointment as Chief of Social Analysis, in which capacity he acted as general editor of the comprehensive series of census monographs prepared on the basis of the data obtained at the decennial census of 1931. In his later years MacLean was an ardent student of the problems of population, laying under contribution, besides the statistics of the census, all the

varied data coming into the Bureau of Statistics, such as vital statistics, immigration statistics, etc. His latest publication is the census monograph "The Age Distribution of the Canadian People: (A study based on the Census of 1931 and Supplementary Data)." MacLean was also the chief contributor to the elaborate census monograph on "Unemployment," published in 1938, besides exercising a potent influence upon the preparation of the other census monographs issued under his general direction. He was a contributor to this JOURNAL, the *Canadian Journal of Economics and Political Science*, and to *Public Affairs*, a quarterly publication issued by Dalhousie University, his original *alma mater*. MacLean represented Canada at the Congrès international de la population in Paris in 1937, to which he contributed a paper on "The Canadian Family" published in Volume IV of the report of the congress.

As the result of MacLean's contributions to statistics he was elected a member of the International Institute of Statistics in 1935, being one of the four Canadian members of that organization. He was also a member of the Royal Statistical Society and the Institute of Mathematical Statistics. Born a Cape Breton Highlander whose mother tongue was Gaelic, he became the founder and president of the Gaelic League of Ottawa.

MacLean's experience as a teacher, together with his high mathematical qualifications, made him an ideal instructor and supervisor for the younger members of the Bureau's staff, to whose advancement in knowledge he devoted much time both inside and outside of office hours. His death caused profound grief to his colleagues and associates throughout the Bureau, and his funeral was very largely attended by them, particularly notable being the large number of young men. Through these his influence will long be felt in the Bureau, and his example of devotion to duty will be an inspiration to higher and more scientific standards of work. *Ave atque vale.*

S. A. CUDMORE

BOOK REVIEWS

GLENN E. MCLAUGHLIN
Review Editor

Elements of Statistical Reasoning, by Alan E. Treloar. New York: John Wiley and Sons, Inc. 1939. xi, 261 pp. $3.25.

When I accepted from our review editor the invitation to review this book, judging from its title, I anticipated an essay on the fundamental logical problems of probability. I looked forward fearingly to having to cope with the conundrums of a priori versus empirical assumptions, inductive inference versus deductive mathematics, the real or fanciful meaning of "equally likely," and Keynes versus von Mises. Happily, the book turned out to be no such awesome challenge. The reader will comprehend its general scope and contents if I say that it could have been appropriately titled "An Elementary Textbook of Statistical Methods, With Emphasis on Biological Problems." It covers almost the same ground (and is strikingly parallel to) Pearl's *Biometry and Medical Statistics*. The book is intended for the beginning student and for practical application, and eschews small sampling theory—wisely, in the opinion of this reviewer. Yet, it incorporates recent contributions to statistical technics, and the student will become acquainted with the terminology of the Fisherian statistics—"statistic," "replicate," "null hypothesis" and so forth. The author himself evidently has a predilection for new names for old friends, and the reviewer notes with interest (and mild disapproval) a new term for the a priori distribution from which samples are considered to be drawn: Sometimes called the "universe," or "collective," or "population." Professor Treloar calls it a "supply."

The volume contains sixteen chapters dealing with the following subjects: numerical distribution, the law of frequency distribution, typical values, the measurement of variation, moments and distribution characteristics, the normal curve, bivariate distribution and the coefficient of correlation, rectilinear regression, residual variation, errors of random sampling, sampling errors of the correlation coefficient, proportions and probability, the proportions of vital statistics, sampling errors of proportions, the measurement of frequency discordance, and independence and bivariate tables of frequency. The discussions are well illustrated with clear examples, some of them from the classic literature of statistical journals, most of them from new data. An appendix furnishes a table of functions of the normal curve, the probability integral of χ^2 as well as some tables for the evaluation of the probability of the correlation coefficient. There is a list of selected formulas as well as an index.

Here and there in the book the reviewer noted points with which he must disagree. For instance, on page 112, the author says, "Any bivariate frequency surface not characterized by perfect correlation has two regression lines, each one serving for prediction *in only one direction*." [Italics in the

original.] Here, unless I misread, is a common misunderstanding, to wit: that which of the two regression lines should be fitted is determined by which variable is to be predicted (the dependent variable), that the regression line to be used is that one obtained by minimizing the squared residual of the dependent variable. According to least square theory, the regression line to be fitted is determined by which variable (if only one) is actually subject to gaussian variation, and not at all by which variable is the dependent one for the problem in hand. For instance, if a regression line is to be fitted to a series of observations of the blood sugar decrease produced by the injection of known amounts of insulin, the variable minimized should be the blood sugar decrease, even though the line, after it is obtained, is to be used primarily for the prediction of insulin from an observation of the blood sugar drop. If one should desire to predict the blood sugar drop from the insulin, this same line is the one which should be used. This is because in the experiment, the insulin was injected in known quantities and was not subject to error (practically), while the blood sugar decrease *was* subject to variation.

On page 182 is a table of "Student's" observations from his classic article "On the Error of Counting With a Haemacytometer." The table reads that the distribution is for erythrocytes. This is incorrect—"Student's" observations were for yeast cells. Let not the reader say that this is an unimportant difference. This reviewer spent a hard year's work investigating the erythrocyte distribution in the hemocytometer, because "Student's" results for yeast cells could not be assumed for erythrocytes. Moreover, on page 219 the author refers to this series of observations and a Poisson which has been fitted to it as an example for which the chi-square test can be used. The present reviewer has demonstrated in the pages of this Journal that this is not a good test for the problem in hand.

Pages 219–226 deal generously and clearly with illustrations of the chi-square test applied to different situations. I find it no more satisfactory in some aspects than I do the treatment of this subject in other standard texts. For instance, table 36 tests by chi-square the distribution of observed survivals per planting in a series of 1120 plantings, six seeds in each, against the survivals expected on the basis of a binomial distribution, for which the rate equals the average survival rate $\bar{p}$. The argument here is that if the survivals are "independent," and the probability of survival is $\bar{p}$, they will be distributed according to this binomial and the chi-square test will yield a low P only infrequently. Hence, the actual finding of a low P is taken to indicate a lack of independence. But the same argument could be made for another test, say, the calculation of $n's^2/(n\bar{p}\bar{q})$ ($n'=1119$, D.F. for s^2, and $n=6$), which will also be distributed as chi-square if the distribution of survival follows the binomial. In the example mentioned, this test also yields a very low P and no practical problem of choice arises. But in another case this latter P could be different and yield a non-significant value. Which one then should be taken to determine whether the difference between the observations and the binomial distribution is significant? On what principles is the choice of a

particular test based? Is it always the chi-square test that is to be preferred? Again, there are a number of examples (pages 223–225) of the use of the chi-square test for testing the normality of a distribution. Supposing in one of the cases where the chi-square P was too high to indicate a significant difference, a test were made comparing the observed skewness or kurtosis with the values for a normal distribution, and it yielded a low P. Should we be guided by the last results for judging the normality or that of the chi-square test? In regard to the last cases, those using the chi-square test for testing normality, another teacher of statistics, the author of an authoritative text, acknowledged to me that the chi-square test is inappropriate, that the tests for skewness, kurtosis, and so forth, should be used, and that this was the reason he left the chi-square test for normality out of his book!

These instances of disagreement are relatively few, and, moreover, they refer to controversial matters, regarding which this reviewer is not the final arbiter. The book as a whole is soundly done and written in a manner which beginning students comprehend and enjoy, as I know from personal testimony. I wish it a happy and successful career!

JOSEPH BERKSON, M.D.

Mayo Clinic

Theory of Probability, by Harold Jeffreys. New York: Oxford University Press. 1939. vi, 380 pp. $7.00.

The book is meant to be revolutionary and as such is very interesting. In the three chapters 1, 7, and 8, vastly given over to polemics, we are told that the theories of probability developed by others, in particular, their definitions of probability, are not satisfactory and that if modern statistical work does bring valuable results, it is only because the statisticians forget their own definitions and, without noticing it, follow the lines of thought of Dr. Jeffreys. The author's object is "to provide a method of drawing inferences from observational data that will be self consistent." He starts by formulating eight rules to guide him in building the theory. Next follow axioms and conventions, the main one being that, for any data, there exists a unique reasonable degree of belief in any proposition q and that such degrees of belief can be arranged in order of magnitude. The probability is a conventional numerical value of the reasonable degree of belief. The degree of belief in the impossible is proved to be always zero. That in certainty is conventional and is not definitely fixed: frequently it is unity, but in some cases the author prefers infinity. The conventions and axioms are followed by theorems, first of a general nature and then of a particular character. Jeffreys' point of view is somewhat similar to that of B. O. Koopman ("The axioms and algebra of intuitive probability." *Annals of Math.*, Vol. 41, 1940). The difference is that Koopman attempts (very successfully) only to build a mathematical model of the process of thinking in terms of "probable," whereas Jeffreys goes beyond that point and insists on assessments of

numerical probabilities. In his opinion, which the reviewer finds it difficult to share, there is in each situation a unique true numerical probability of any proposition q and our object is to estimate it correctly.

The author's treatment of problems of estimation and of testing hypotheses consists of assuming *a priori* probability distributions and of dealing with probabilities *a posteriori*. It is suggested that in each case there is just one distribution *a priori* which is the proper one. The reasons for the author's choice are frequently puzzling. For example, in cases where a parameter v may have any value $0<v<+\infty$ and nothing else is known about it, the author tells us that the proper *a priori* distribution is $p_0(v)=c/v$, with its integral diverging at $v=0$ and $v\to\infty$. An alternative suggestion of $p_1(v)=cv$ is discarded by the author because it would imply that $P\{0<v<a\}/P\{a\leqq v<+\infty\}=0$, or that it is more probable to find v in the infinite range $(a, +\infty)$ than in the finite $(0, a)$, "which would be inconsistent with saying that we know nothing about v." But quite similar objections could be, and have been, raised against the author's favorite $p_0(v)=c/v$. In fact, whatever $0<a<b$, we shall have

$$\frac{P\{a\leqq v\leqq b\}}{P\{b<v<+\infty\}}=\frac{P\{a\leqq v\leqq b\}}{P\{0<v<a\}+P\{b<v<+\infty\}}=\frac{P\{a\leqq v\leqq b\}}{P\{0<v<a\}}=0$$

These objections are dismissed as follows: "if we know nothing about the value of v, except that it may have any value over an infinite range, we must in any case regard it as a remarkable coincidence if it should be found in any particular arbitrary finite range." If so, then why reject $p_1(v)=cv$? And then what about $p_0(v)=c/v$ and the comparison of the two ranges $(0, a)$ and (a, b), both finite, the first arbitrarily small and the other arbitrarily large?

The author's criticism (Chapter 7) of theories of probability, based on conceptions of measure and of frequency, is somewhat bitter and his description of these theories is hardly adequate. It is also with some regret that the reviewer finds Dr. Jeffreys opposed to what he considers an excessive tendency towards mathematical accuracy.

As this book is revolutionary, it is probable that many readers will disagree with it, but all of them are likely to be very interested.

J. Neyman

University of California, Berkeley

The Variate Difference Method, by Gerhard Tintner. Bloomington, Indiana: Principia Press, Inc. 1940. 175 pp. $2.50.

The author of this book presents the first comprehensive treatment in English of the variate difference method as applied to time series analysis. Although the subject is treated from the point of view of probability, it can

easily be followed by people without much training in mathematical statistics. Numerous tables and examples are presented making the proposed method of analysis easily accessible to most economists.

The underlying assumption of the variable difference method is that the elements of a time series are composed of two parts—a smooth part (mathematical expectation) and a random part. The smooth part is not subject to the laws of probability and can either be entirely eliminated or at least greatly reduced by successive finite differencing. The random part is subject to the laws of chance and cannot be thus eliminated.

The major portion of the book is devoted to establishing methods for determining the stage in the process of finite differencing at which it can be said that the smooth part has been eliminated. The decision is based on the following reasoning. If the smooth part has been eliminated with the k^{th} difference, then the variances of the k^{th} and higher differences (multiplied by a suitable constant) must all be equal. Since the sample variances of the differences are subject to fluctuations, the decision as to their equality must be based on tests of significance. Two such tests are given in this book. One depends on large sampling theory and the second, applicable to small samples, is based on Fisher's z-test.

The information obtained from the above method of differencing and tests of significance is utilized in determining the degree of the polynomial which is to be fitted (by the technique of moving averages) to consecutive points of the time series. The rule given is that if the smooth part seems to be eliminated at the k^{th} finite difference, the degree of the polynomial is $k/2$ for k even or $(k+1)/2$ for k odd.

Though this book is to be welcomed for its attempt to introduce modern statistical ideas into economic analysis, the actual application made by the author of these ideas to the problem at hand seems to be of limited value. The method of analysis proposed by the author, in spite of the laudable refinements, still remains to a large extent a method of empirical curve fitting. The statistical tests proposed for testing the equality of the variances are subject to a great many limitations. Not only must the conclusions be based on fewer and fewer degrees of freedom (and in most time series analyses there are only few observations to begin with) but at any given stage the analyst is faced with a choice of several series from which to calculate the variances to be tested. If he gets inconsistent answers for the several possible series (and this possibility is not at all excluded) he has, on the basis of the techniques presented, no way of making a valid decision. Neither will he know how to interpret the results if he obtains nonsignificant answers at some stage of differencing and significant results at a later stage.

Strictly speaking, the flexibility attributed to the variate difference method as contrasted to fitting orthogonal polynomials to the whole series is characteristic of any method of curve fitting which employs moving arcs. The contribution of the variate difference method is largely in the direction

of determining the degree of the arc to be fitted. The coefficients of the arc may be determined by the method of orthogonal polynomials as well as any other method.

M. A. Girshick

Bureau of Agricultural Economics

Applied General Statistics, by Frederick E. Croxton and Dudley J. Cowden. New York: Prentice-Hall, Inc. 1939. xviii, 944, xiii pp. $4.00.

In many respects this volume might better be designated as an encyclopaedia of statistical methods than a textbook on the subject. The authors have made an honest attempt to cover the field from the time when an investigator discovers that he has a problem which involves the use of statistical techniques through the various steps of analysis to the final presentation and interpretation of the results. Furthermore, the reader is not often irritated by the time-worn statement that some topic "is beyond the scope of this work."

Many statisticians will feel that a disproportionate amount of space is devoted to the analysis of time series. Out of 822 pages of text material not less than 345 pages can be assigned definitely to time series. It is true that 78 of these pages are concerned with index numbers. Many teachers will regret that the authors did not give more attention to index numbers and less to various types of trend such as "weighted moving averages." The beginner in the field of statistical methods would probably appreciate a clearer statement of the merits and defects of the various methods which may be employed in measuring the seasonal component in a time series. In general, the analysis of time series follows the "classical" treatment. It is, perhaps, unfortunate that no indication is given in the text or in the references to the work being done in this field by Frisch, Tintner, and others.

The measures of reliability and significance of statistical measures, correlation, whether linear or non-linear or simple, multiple or partial, are well developed. Generally, the illustrations are well chosen and the steps involved shown in detail. Again, many will regret that the authors did not give less space to time series and more to the problems of sampling, especially that phase which concerns the design of statistical inquiries, and the analysis of variance.

No review of this work could purport to be complete which did not take note of the eighteen excellent appendices. These alone account for some 120 pages. A mathematical appendix together with a glossary of symbols and formulae will be extremely valuable to the professional statistician. Those statistical tables to be found in most textbooks are here published, such as one giving areas under and ordinates of the normal probability curve. There are also tables of the values of t, z, F, and L.

In the second printing, a number of errors have been corrected, but others remain. For example, 602106 is given on page 899 as the square of 776.

L. EDWIN SMART

The Ohio State University

Théorie Mathématique du Bridge à la Portée de Tous, by Émile Borel and André Chéron. Paris: Gauthier-Villars. Vol. V of the series 'Monographies des Probabilités,' published under the direction of E. Borel. 1940. xi, 392 pp. 175 fr.

We are told that the era of encyclopedism is long since over and that at present all human activities have become so specialized that it is impossible for a single individual to be successful in more than one broad field of interest such as science, politics, art, and so forth, or even in more than one section of the same field. Only some thirty or forty years ago, a mathematician was a mathematician and, while he would not generally be suspected of being a physicist or an artist at the same time, it was assumed to be quite proper for him to be active in or, at the very least, informed of all the various branches of mathematics. There are exceptions, but this is no longer the general rule. Now, instead of "a mathematician" we mostly have a geometer, a topologist, a specialist in the theory of numbers, in probability, and the like. The situation is similar in other sciences.

In this general picture the personality of Émile Borel is quite outstanding and out of the general rule. In January, 1940 there was a celebration of the just completed half century of his scientific work and his students, friends, and admirers prepared an imposing volume (*Selecta*, Jubilé Scientifique de M. Émile Borel, Gauthier-Villars, Paris, 1940) containing reprints of a sample of Borel's scientific papers and the list of his published works. It appears that during the period of fifty years between 1889 and 1939 Borel has had 259 publications including 33 larger and smaller books! Most of these publications were mathematical but they had an enormous range of direction—differential equations, geometry, theory of functions of complex variables, theory of functions of real variables, series, theory of sets, and in particular theory of measure, probability, statistics, and mathematical physics. But apart from these we also find papers and books on philosophy, aviation, and strategy!

I need not mention specifically that the creative scientific work of Borel was successful. In whatever branch of mathematics he happened to work, his name will be remembered for long—marking particular theorems, measures, categories of sets. Apart from writing Borel is most active in organizing and editing various serial publications on the theory of functions, probability, and mathematical physics.

One would think that scientific activity with the above range of directions and efficiency would exhaust the energy and time of any man. But not Borel.

He was and still is most active politically. Member of the Chamber of Deputies for many years he was once Minister of the Navy. Frequently he would address public meetings both in France and abroad. Once I heard him speak at a public meeting in London organized by an international organization for propagation of peace and condemnation of aggression.

Now the book, the title of which precedes this somewhat long introduction, shows still another side of Borel's mentality. To the reviewer it was most unexpected. Apart from the huge amount of scientific work, the editing of a continuous flood of notes that he receives almost daily with requests to present them to the Academy, the troublesome work in parliament, worries with serial publications, and lecturing, it appears that Borel has time for recreation also and plays bridge! And this is not done in any dilettante way—he finds energy enough to take an interest in working out a mathematical theory of the game and discusses it with M. André Chéron, a professional and editor of the bridge columns in *Le Temps*, *L'Illustration*, and other periodicals.

The book under review is just the outcome of these discussions and the joint numerical and theoretical work of the two authors. The general plan of the book follows the several stages of the game. First the cards are shuffled and thus Chapter I deals with the theory of shuffling. An unsophisticated bridge player may think that shuffling is a trivial matter—just mix the cards thoroughly. But the problem is not so simple and whoever consults Chapter I of this book and also a Note at the end of it will be amazed to find various mathematical problems which arise and, unexpectedly, have their applications in physics.

After the shuffling the cards are distributed among the players and Chapter II lists the probabilities of various combinations.

Chapter III deals with the period in the game when the players see their hands and bid. The mere consultation of one's hand immediately changes the probabilities of various combinations tabled in Chapter II. The bids of the partner and the opponents introduce further changes which, of course, introduce a new and somewhat subjective element. Chapter IV is concerned with new situations arising with the moment of the lead and the opening of the dummy. Now many new circumstances become known and each of the players is aware of the whereabouts of 27 cards, instead of the original knowledge of 13 only. In Chapter V the authors use previously calculated probabilities to compute mathematical expectations of scores on following one or another of several possible tactics in a number of situations.

The main text is followed by nine Notes devoted to more theoretical questions.

As the authors state in their Preface, the book was ready for print in May, 1939 and was to appear on the shelves in October of that year. However, the anxious time during the Summer of 1939 and the outbreak of war precluded Professor Borel from the necessary work on the last touches. These were done by M. Chéron exclusively and he recalculated the tables and also

introduced various small changes which justify the addition to the title "à la portée de tous" (=accessible to all).

About 350 years ago the theory of probability started its existence by considering games of chance. Since that time the problems of games have gradually lost their role of originating mathematical problems. They are still discussed in some books on probability serving as examples, but even this is being discontinued as there are many interesting examples in physics and biology. The present book revives the old traditions. Mathematically minded readers will find in it fascinating abstract problems and bridge players will find useful data for improving their tactics. I am certain that both categories of readers will find plenty of fun. I did.

J. NEYMAN

University of California, Berkeley

Corporate Size and Earning Power, by William Leonard Crum. Cambridge, Massachusetts: Harvard University Press. Harvard Studies in Monopoly and Competition. 1939. xi, 418 pp. $4.00.

The outstanding student of corporate incomes here presents us with the results of another important and careful investigation based on data made available by the Statistical Section of the Income Tax Unit in the Bureau of Internal Revenue.

The underlying issue Professor Crum deals with in the present study is: "To what extent is corporate earning power related to the size of corporate enterprise?" In dealing with this single aspect of corporate incomes he necessarily analyzes other important features of corporate incomes, such as: cyclical variations in corporate earning power, industrial differences in corporate earning power, relations of inventory profits to the earning power of corporate entities, influences of interest payment burdens on corporate earning power, relations of compensation of officers to reported corporate net incomes, and relations of capital gains and losses to corporate earning power. All such matters as these, however, are considered primarily insofar as they influence the answer to the underlying issue.

The period covered by this investigation is primarily 1931–1936 inclusive. After presenting a general answer to the underlying problem in terms of this six-year period, the study presents answers to the underlying issue for eight major classifications of corporations: manufacturing, mining, agriculture, construction, trade, service, public utilities (including transporation), and finance. These major classifications are further subdivided insofar as the available data permit, and answers are given to the underlying problem for: metal manufacturing, motor vehicles (based on data for 1936), manufactured foods, chemical industries, petroleum (based on data for 1936), textiles, clothing and fabrics (based on data for 1936), printing, paper and pulp, forest products, stone, clay and glass products, liquors (based on data

for 1933 to 1936 inclusive), tobacco, leather, rubber, and a miscellaneous (unclassified) group of manufacturing corporations.

After defining profit or return as a residual amount (including capital gains) available to equity owners after all prior claims have been met (including income taxes), defining capital invested by owners as an average book value of the equity, measuring the size of a corporate enterprise by the book value of total assets, and identifying a business unit as an entire enterprise operated by a single corporation, the basic answer given to the underlying issue is: on the average, large corporations are more profitable than small corporations. Furthermore, in this connection it is shown that on the average the advance in the rate of return with increasing size is characteristic of all corporations taken together with total assets below the size class of $500,000 to $1,000,000 and that this advance on the average continues at a slackened pace for corporations with total assets in the size classes of $1,000,000 to over $50,000,000. This is especially so for manufacturing, trade, and finance. It is shown, too, that in those instances in which the rate of return on the average declines with assets above size classes of $5,000,000 and over, corporations in these size classes have been enjoying on the average higher rates of return than the corporations with assets in size classes below $500,000 in the same industrial classifications. In general, the deviations from this average pattern of the relation between corporate size and earning power are considered by Professor Crum to be negligible, although in some specific instances it appears to be rather striking, as in the case of motor vehicles in 1936, chemical industries for 1931–36, petroleum in 1936, clothing and fabrics in 1936, liquors for 1933–1936, rubber for 1933–1936, agriculture for 1931–1936, and public utilities for 1931–1936.

In the investigations that attempt to get underneath this general average pattern, the most important single matter discovered appears to be that for practically all classifications of income corporations (i.e., the various corporations that reported an income during each of the six years between 1931–1936), the rate of return on the average either decreases slowly, or remains approximately constant, as the size of the corporations increases; whereas in the case of deficit corporations (i.e., the various corporations that reported a deficit during each of the six years between 1931–1936), the rate of return on the average increases rapidly as the size of the corporations increases. In the main, then, the central average pattern, showing that the rate of return on equity is more or less progressively advanced as the size of the corporations is enlarged, is statistically dependent primarily on the observed behavior of deficit corporations, corporations that have reported negative rates of return on equity.

In order fully to substantiate the basic answer given to the underlying issue a number of factors, such as cyclical variations, industrial differences, inventory profits, role of debt, compensation to officers, capital gains and losses, income taxes and consolidated returns, that might have influenced

the statistical results were accounted for, according to Professor Crum, in such a way that the significant correlation presented between size and earning power was confirmed, and the observed differences in the rate of return associated with the various size classes of corporations were therefore attributed primarily to differences in total assets.

Of these various matters the study of the compensation of officers yielded the most interesting results. There has long been prevalent a general notion that small corporations tend to expend a larger percentage of their gross income for the compensation of officers than do the large corporations, and if allowance were made for this alleged practice, an observed general average relationship between rate of return and size would then have to be seriously qualified. Furthermore, if compensation to officers is in reality part of the profit-share, and, as some economists think, should be considered as such, then any average general pattern observed regarding size and earning power not fully taking account of this factor might well be erroneous. The study of compensation of officers showed clearly that the ratio of compensation to equity declines as the size of corporations increases, but regarding this matter Professor Crum believes that a smaller rather than a larger share of salaries to officers in small corporations should be regarded as "concealed profits." He did find, however, that if all executive compensation is to be considered as part of the profit-share, then on the average, large corporations are less profitable than small corporations, completely reversing the basic answer he had given to the underlying question. This upset is not taken seriously by Professor Crum because he argues that a very substantial portion of compensation of officers cannot be considered as "concealed profits" and in this connection he points out that if one-half of executive compensation between 1931 and 1935 was considered to be part of the profit-share the general average pattern would still be confirmed—i.e., there would be an advance in the rate of return with increasing size.

Whether or not the underlying correlation between rate of return and size is to be given a significant causal interpretation is not made clear. Nowhere in the book is it explicitly stated that an increase in total assets of a typical corporation will necessarily bring forth an increase in profitability. But it is made apparent that such a causal interpretation might well be culled by the reader, for many of the other influences on the rate of return are shown to have either no effect or a negligible effect on the rate of return.

As the reviewer read this book he was strongly driven in the direction of accepting the basic answer given to the underlying issue and practically all the other conclusions. Professor Crum shows abundant evidence of having an exceptionally thorough knowledge of the limitations of the data. He is an excellent statistician and shows it on almost every page of the volume. Furthermore, he has always carefully qualified his general statements, has noted many exceptions to his general conclusions, and has continually raised questions regarding his own analyses, indicating conclusively that this study was made with meticuolus care.

And yet certain questions irresistibly come to the mind of the reviewer. As related to the kind of knowledge that gives us an understanding of how the existing business system functions, especially as related to profit theory, what is the essential meaning of the "rate of return" as measured by Professor Crum? It is a ratio relating compiled net income after taxes of corporate entities (between 1934 and 1936 some of these corporate entities are part of others) to a book value measure of equity. The compiled net income after taxes of all corporations is related to an addition of the book values of preferred capital stock, of common capital stock, of surplus and undivided profits from which is deducted the book value of deficits. The ratio is not directly reflective of a wage rate for enterpriser's services. Furthermore, as it is measured by Professor Crum, the denominator of the ratio may to a considerable extent reflect the numerator, especially in the case of deficit corporations, for obviously deficits are deducted from the denominator. Under these circumstances precisely what is the justification of identifying this rate of return with profitability or earning power? If an attempt is being made to ascertain limits to the size (as measured by total assets) of corporations, may it not be preferable to combine in the numerator both net income and salaries to officers on the assumption suggested by such economists as J. B. Say, Alfred Marshall, and F. W. Taussig that profit is an income share paid for an indivisible combination of both executive services and capital services rendered to business firms? Should this be completely done, then the basic answer given to the underlying issue, by Professor Crum, is completely upset.

In addition, precisely and explicitly what is the essential meaning of relating the rate of return to various size classes determined by total assets? Are the total assets of a business firm an important causal factor regarding profitability, or are other matters, both those that are and those that are not directly associated with differences in total assets, the significant causal factors regarding corporate earning power? In this connection we should note that Professor Crum is fully aware that the book value of the total assets of a given business firm cannot be definitely identified with scale of operations (size as usually defined by the economist) of that business firm, and accordingly Professor Crum warns the reader against drawing any significant conclusions from his study regarding the relation of profits to scale of operations. He is also fully aware that total assets cannot be clearly identified with the existence of monopoly and so he warns against drawing any significant conclusions from his analysis regarding the effect of monopoly.

Furthermore, precisely what is the significance of the pattern showing that for those corporations reporting a net income the rate of return either tends to decrease or tends to be more or less stable as the total assets of these various corporations are augmented? As Professor Crum often points out, the answer he presents to the underlying issue is based primarily on the observed behavior of deficit-corporations. In other words, given the meas-

urements he presents of rate of return on equity, it may well be that all he really shows is that the larger a corporation (as measured by the book value of total assets), the less likely it is to be subjected to high rates of deficits; and that the high rates of deficits are found on the average in small corporations.

Professor Crum does not seem to have emphasized sufficiently that there is a tendency, according to his analysis, for the relative variability in the rate of return to decline with increasing size. According to the data presented, the smaller the corporation the greater is the likelihood that it will report either a relatively large rate of return or a relatively large rate of deficit and the larger the corporation the more likely it is that either a relatively small rate of return or a relatively small rate of deficit will be reported. To the reviewer this seems to be an exceedingly important discovery. It might well be that this is quantitative evidence (assuming that the rate of return as measured reflects earning power) that small corporations (assuming that total assets adequately measure size) are subjected to greater risks on equity capital than are large corporations.

In spite of any criticisms of merit that may be contained by implication in the raising of the above questions, this is an important and exceedingly useful study which should be of great interest to economists, security analysts and business men. The statistical charts and tables are of great value and even the tempered conclusions drawn on the basis of the analyzed data may go a long way not only toward stimulating thought regarding the functioning of the existing profit system, but also toward eliminating certain strong and unfounded presuppositions.

S. H. NERLOVE

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Textile Markets, Their Structure in Relation to Price Research. New York: National Bureau of Economic Research. Report of the Committee on Textile Price Research to the Conference on Price Research. Price Studies No. 2. 1939. xx, 266 pp. $3.00.

The Committee on Textile Price Research was appointed in 1936 by the Conference on Price Research, established by the National Bureau of Economic Research, as one of five similar industry committees set up to investigate the possibilities of price research in the industries with which they were concerned. The Committee was composed of five members, with Dr. Stephen J. Kennedy, of the Pacific Mills, as Chairman, and of six advisory members. The Committee established as its chief objectives: "(1) the development of an overall picture of the market structure of the textile industries; (2) the study of economic areas in which price behavior is of particular importance." A third objective, cooperation in sponsoring improvement and amplification of textile price data, was referred to the Textile Statisticians Group, which already existed for that purpose.

In developing an overall picture of the market structure of the textile in-

dustries, the Committee emphasizes a characteristic of such industries which is of paramount importance in any textile price research. This characteristic is the "segregation of the successive processes of fabrication and their performance by separate firms" and consequent "separation of wholesale and retail distribution from the manufacturing function." This characteristic has produced a market structure more complex than that in any other American industry.

As ordinarily used, the term "textile industry" embraces only cloth manufacturing operations. In this report, however, the "textile industry" embraces all manufacturing and distribution functions, including cloth manufacturing, fabricating, and distribution.

The specialized sense in which the term "market" is used throughout the report requires emphasis. As used here, "market" means "the buyers and sellers of a group of products, closely related in character and produced from the same equipment or by the same type of mill which tend to be sold interchangeably to the same group of purchasers." This definition places primary emphasis on products, not geographical areas.

In accordance with these concepts, the Committee recognizes the following textile market levels: (1) raw fiber markets; (2) processed fiber markets; (3) yarn markets; (4) gray goods markets; (5) finished goods markets; (6) fabricated products markets; (7) wholesale markets; and (8) retail markets. At the lowest level, raw fiber markets, violent price fluctuations are usual; at the highest level, retail markets, relatively stable prices are found. The markets intermediate between these extremes must adjust the differences.

Part I of the report is essentially a description of the various market levels and of the markets at those levels. Characteristics of the product are detailed; the influence of quality and grade differentials is explained; and the scope of the market is delineated. Of great value also are the suggestions concerning the selection of representative items for price analysis and the tabular presentation of sources of current price and related data.

Part II of the report contains the Committee's suggestions with respect to desirable and fruitful research that might be undertaken in the field of textile prices. These suggestions are not made in terms of market levels, but in functional terms. Moreover, the suggestions are in terms of "areas" in which research might well be undertaken, not in terms of specific research projects. In its own words, the Committee aimed in this part of the report at suggesting "what needs to be known, not how it is to be discovered."

Nine "areas" of study are suggested: (1) prices and buying movements; (2) prices and fiber and product substitution; (3) prices and costs; (4) prices and capacity; (5) prices and marketing methods; (6) prices and industrial organization; (7) prices and business cycle; (8) how prices are made in typical textile markets; and (9) improvement of the price record. In connection with these areas, the Committee discusses some of the problems requiring study and the availability of necessary data.

The appendices to the report deserve recognition. They deal with textile price data compiled by various departments of the Federal Government: the Bureau of Labor Statistics, the Bureau of Agriculture Economics, the Federal Trade Commission, and the United States Tariff Commission. A useful chart which shows the interrelations of textile markets is inserted in the back cover.

This report will be of assistance not only to research workers in the field of textile prices. but also to those interested in more general textile research. Part I, the various tables, and the appendices constitute a manual which gives in one place the information necessary to an understanding of textile markets and the sources of textile price data. Part II is suggestive and stimulating. It would have been desirable, however, if Part II could have been expanded and made somewhat more definitive.

WILLIAM R. CURTIS

Raleigh, North Carolina

Price Research in the Steel and Petroleum Industries. New York: National Bureau of Economic Research. Prepared for the Conference on Price Research. Price Studies No. 3. 1939. xiii, 170 pp. $2.00.

This volume contains the reports of two committees established by the Conference on Price Research, which was organized by the National Bureau of Economic Research. Part I contains the report of the Committee on Price Research in the Iron and Steel Industry, of which Professor Samuel S. Stratton of the Harvard Graduate School of Business Administration was chairman, and Part II, the report of the Committee on Price Research in the Petroleum Industry, of which Professor M. W. Watkins of New York University was chairman. These reports bring the total of industry committee reports to the Conference on Price Research to four, which include bituminous coal, cotton textiles, iron and steel, and petroleum. A report on automobiles is to follow. These reports do not present the results of substantive price research. They present, rather, proposals for research. In addition, they include an account of the general industry characteristics which affect prices and some appraisal of the factual data available for the study of prices.

The Committee on Price Research in the Iron and Steel Industry begins its report with a very brief description of the characteristics of the industry that affect prices, including conditions of production, methods of distribution, and the structure of prices. Necessary emphasis is given to the high degree of integration in the industry, but as a whole this section suffers somewhat from brevity and lack of definitiveness.

The report next presents a survey of the existing quantitative data relating to the price structure in the iron and steel industry. The sources listed include not only data on prices themselves, but also related data. The source listings are followed by a brief appraisal of the data.

The final sections of the report are devoted to outlining a program of research projects. This program is divided into: (1) projects at present feasible; (2) projects of great importance but not necessarily practicable immediately; and (3) comprehensive projects without regard to immediate practicability. Research projects at present feasible are further divided into: (1) those suitable for governmental agencies; (2) those suitable for research institutions; and (3) those suitable for individual research workers. The projects included here range in completeness from somewhat detailed programs to a listing of project titles.

The Committee discusses in detail the two projects which it considers to be particularly important. These two projects are: (1) effect of the basing point price practice upon regional economic development; and (2) elasticity of demand for individual iron and steel products.

The general program of research, suggested without regard to immediate practicability, is set forth in order to provide a framework of reference for immediate research. The general program is of value, too, as a guide to price research in the iron and steel industry.

The report of the Committee on Price Research in the Petroleum Industry, which comprises the subject matter of Part II of this volume, is incisive, well-organized, and stimulating. Beginning with a definition of the petroleum industry which includes "the whole sequence of processes from exploration for oil to the delivery of refined petroleum products to consumers," the Committee presents, in turn, the general characteristics of the petroleum industry and its price problems, a survey of the available statistics, an appraisal of the statistics, and a program of research.

Each of these presentations has especial merit. The general characteristics of the petroleum industry and its price problems are given briefly but with perspicacity. The survey of available quantitative data is presented in usable tabular form. The appraisal of the quantitative data includes, on the one hand, an analysis of existing data, and, on the other, recommendations for improving and supplementing existing data. In its appraisal of existing data the Committee used two standards, one qualitative, the other functional. Its qualitative standard aims at providing reasonable dependability in data. Its functional standard aims at providing data useful to executives in discharging their responsibilities and to outsiders and students in the study of the industry in both its internal and external relationships.

As an immediate program of price research, the Committee outlines four projects, but places greatest emphasis on the first: (1) relation of price, cost, and earnings movements to supply and to the course of investment in the industry; (2) elasticity of demand for principal refined products; (3) effect of proration or concerted curtailment on the cost and price of crude petroleum; and (4) production costs and cost-price relationships. In connection with each of these pojects the Committee presents an analytical discussion of problems and suggests general methods of attack.

The Committee conceives of this research program as in the nature of an

ad interim report and looks toward additional recommendations based on its development. The completion of the suggested program would have general significance, both with respect to the problems with which it deals and as a stimulus to additional activity.

WILLIAM R. CURTIS

Raleigh, North Carolina

Competition Among Grains, by N. Jasny. Stanford University, California: Food Research Institute. 1940. xiii, 606 pp. $4.00.

This book, according to the director's preface, "deals with inter-commodity competition among the five grains which include all those of major importance except rice. It is concerned with their competition for various uses and for factors of production, under a great variety of conditions and circumstances."

The author has collected, sifted, and summarized an enormous amount of material relating to the technical as well as the economic aspects of production and marketing of the major grains. This was a time-consuming task. The author is to be commended for undertaking it. The job needed to be done. A large amount of pertinent data on production, world trade, and prices has been brought together and compared for wheat, corn, rye, barley, and oats.

Perhaps the book will be of greatest usefulness to persons interested in economic geography, and to agronomists who desire to obtain a regional and world perspective on the production and marketing of grains.

Some generalizations for broad regions, and even for the world as a whole, have been attempted for each grain, and for their impact on each other. The reviewer is not competent to judge adequately the validity of some of the generalizations concerning technical production aspects. The summary of evidence on the nutritive value of the grains for food and feed seems to be well done. The chapters on soil, temperature, moisture, and cultural practices as affecting yields of the different grains furnish a necessary background concerning the physical limitations on the production of each grain.

The chapters dealing with economic considerations on the production side do not carry out a fully satisfactory analysis of the distribution of these grains within this physical setting. A more adequate economic analysis would have been possible by approaching the problem in terms of the highest income alternatives to producers in view of their location, their resources, and the farm prices received for the different grains. These alternatives are conditioned by institutional factors as well as by the free play of market forces. This approach would substitute comparative advantage analysis for the average cost versus average price comparisons that are made in part IV. To be sure, the author does not make direct comparisons between the average computed cost and the average computed price for each grain. He

resorts to ratios of costs and prices of one grain compared to each of the others for the areas considered. Also the cost data used have been computed by charging uniform rates for each factor used.

Although this method is probably better than a simple comparison of costs and prices, it does not appear to yield satisfactory results. The supplementary relationship among corn, oats, wheat, and barley with respect to use of labor and equipment is not taken into consideration; nor is the complementary relationship of corn and wheat (or oats) with respect to use of land. For directly competing crops a more direct approach can be made by comparing *differences* in variable costs with the *differences* in expected income (computed from normal yield and price differences). To consider adequately the supplementary and complementary relationships, the substitution method would have to be extended to show the net income to the farm as a unit. Certainly one cannot explain the dominance of wheat over corn in North Dakota, and the corn-oats crop sequence in Iowa by the average cost and average price ratio comparisons which include land rents as an item of cost (see pp. 406 and 422). This approach also seems to be in conflict with the author's discussion of this subject in the appendix (pp. 560–576).

Price differences among grains are discussed in terms of (1) consumers' preference, (2) quality differences, (3) marketing costs, (4) production costs, and (5) protectionist measures. The discussion of consumers' preferences for the different grains is brought out in an interesting manner. It indicates the important effect of custom on preferences for both food and feed. Comparative prices for oats in this country in recent years reflect a lag in adjustment of production to the shrinkage of the market that has resulted from a substitution of mechanical power for horses.

Sherman E. Johnson

Bureau of Agricultural Economics
U. S. Department of Agriculture

The Control of Competition in Canada, by Lloyd G. Reynolds. Cambridge: Harvard University Press. 1940. xiv, 324 pp. $3.50.

This is a concise but penetrating analysis and history of business competition in Canada, with suggestions for improving its working. The author adopts the view, only recently made respectable, that perfect competition is a useful ideal only when attainable in practice, and that the various existing forms of imperfect competition must be judged not by their degree of "imperfection"—which no one has succeeded in measuring—but by more fundamental criteria of economic efficiency.

Canada's leading industries are here classified as monopolies, oligopolies with formal or informal price agreement, and competitive industries. Each of these types, as the author skilfully points out, is subject to its own peculiar

wastes and some compensating advantages. Monopolies set prices at excessive, discriminatory, and too-rigid levels and may (although this point lacks specific illustration) suffer bureaucratic stagnation. Competition among a few sellers, with formal or informal price agreement, is sure to involve a wasteful surplus of production facilities and selling effort, so that the consumer pays excessive prices without extra profit to the seller. In some of the cases analyzed, it seems quite likely that the existing form of competition is worse than outright monopoly. Active competition appears generally as the result of monopsony, excess capacity, or a difference of opinion among sellers as to price policies. In any case it is obnoxious to most of the sellers and if they cannot curb it by joint action they ask the government to fix prices.

A survey of the history of Canadian legislation shows that, particularly during 1930–1935, public authority seems to have been used more to curb than to promote competition. The Combines Act, despite its imperfections, is regarded by Dr. Reynolds as the best basis for the preservation of competition in the industries in which it can effectively function. This group would include most of the industries now practicing competition plus a few others where it could be revived. Reforms are outlined for the strengthening and fuller implementation of the Combines Act.

In the monopoly industries (including public utilities, aluminum, nickel, and several others) the author argues for public operation, since any really effective regulation to insure economic efficiency would mean that practically the whole job of record-keeping, analysis, and administration would have to be duplicated—an obviously wasteful procedure. Public operation is likewise recommended in some cases, such as coal mining or milk distribution, where the economies of unified operation are paramount.

These dispositions of the competitive and monopolistic extremes will encounter relatively little disagreement among economists. One naturally wonders, however, what the author would propose for the many industries for which neither enforced competition nor public operation seems definitely preferable to the present situation. Dr. Reynolds refrains from any definite prescription for the ills of this "price-agreement" group. Acknowledging that this is the field in which the greatest difficulties lie, he suggests that eventual solutions may be evolved when we know more about the operations of these industries. He recommends the creation of a "Division of Industrial Economics" to study a few industries each year and to contribute to the working-out of a kind of controlled competition that will come closer to meeting economic needs.

One wishes the author had shown less caution here. Scattered through his book are ideas which might form the basis of considerably more definite suggestions as to legislation and policy.

This book is certain to attract attention in Canada by virtue of its well-documented analysis of the leading types of competition and its cogent recommendations for reform. On this side of the border too, it should be widely read. Both the similarities and the differences between the Canadian public

policy on competition and ours give food for thought, and at many points Dr. Reynolds has contributed, especially by clarification, to the theory of monopolistic competition.

Edgar M. Hoover, Jr.

University of Michigan

Control of International Trade, by Heinrich Heuser. Philadelphia: P. Blakiston's Son & Co., Inc. 1939. xii, 282 pages. $3.50.

This is one of the few available books on its subject and so far the most comprehensive monographic treatment of the new methods of control of international trade. It is, however, by no means an exhaustive study of recent trends in control of international trade. It deals with import quotas and exchange control, both in their autonomous as well as their bilateral aspects such as quota agreements and clearing and payment agreements. The broad questions of planning of international trade as a whole which are raised not only by the Russian but also by the German system are not discussed.

The book is mainly descriptive and contains very valuable material which otherwise is not easily available. The first part discusses the motives and causes for the introduction of quantitative import restrictions and exchange control measures in various countries. Part two describes the operation of the quota system, the autonomous and bilateral methods of fixing and distributing quotas and the methods of exchange control in various countries. Part three, "The Results of the Regulation of Foreign Trade" contains "a theory of quantitative import control" in terms of ordinary demand and supply curves and other analyses of quotas and exchange control measures.

The book is a very useful contribution to the scant literature on this subject and will be welcomed by all those who conduct courses on international trade and commercial policy. Its usefulness could have been enhanced by a more careful editing and a more detailed and systematic subdivision of chapters and sections.

Gottfried Haberler

Harvard University

English Theories of Central Banking Control, 1819–1858, *With Some Account of Contemporary Procedure*, by Elmer Wood. Cambridge, Massachusetts: Harvard University Press. Harvard Economic Studies, Vol. LXIV 1939. xiii, 250 pp. $5.00.

For the monetary theorist, the economic historian, and the student of central banking technique, Professor Wood's book is bound to assume first-rate importance, since it bids fair to become the authoritative interpretation

of four decades of theory and practice in English monetary history pivoting around the Act of 1844.

To the monetary theorist, chief interest attaches to two propositions which the author himself regards, I believe, as especially significant parts of the book. The first (especially developed in Chapters 1 and 2) maintains that contemporary theories of central bank influence over the commercial banking system devote relatively too much attention to the quantity of member-bank reserves and too little to what Wood calls the "importance of the financial center," i.e. to the limits set on individual bank expansion through the necessity of preserving equilibrium in commodity and security prices and interest rates, with the metropolitan market dominated by the central bank (cf. pp. 20–26, 35, 43, 175–176). The second thesis is that theoretical opinion both early in the 19th century, when there prevailed a consensus amongst the Currency School and its antagonists upon this point, and later, erred in regarding Bank of England procedure as passive adjustment to the external conditions given by the gold standard, whereas in fact, the Bank managed the international standard; and that the successful maintenance of payments after the Resumption is ascribable rather to favorable accident than to "an infallible means of controlling the exchange" (pp. 9, 126, 150–163).

Economic historians will undoubtedly find the most significant parts of the book to be the author's demonstration that the country banks before 1844 were controlled by the Bank—contrary to the belief of most recent investigators of this period, and his intensive study of the division of opinion between Currency School and opposition. Other investigators of the country banks have been misled, he believes, in concentrating their attention on the internal drain and return of Bank notes as if the country banks' reserves consisted of these notes, instead of their holdings of bills eligible for discount with the London banks. The Currency School also made the mistake of regarding Bank notes as the foundation of the credit superstructure. Actually, Bank of England control of the "financial center" guaranteed its control of credit generally (Chapters 1 and 2).

Although Wood devotes the most painstaking attention to actual banking procedures, his main preoccupation as indicated by the title is the contemporary theories. The *cliché* that the followers of Tooke and Fullarton held that prices were not governed by the quantity of money, whereas Ricardo and other Currency School writers maintained the quantity theory line of causation, very inadequately indicates the complexity of issues and the wealth of monetary theory evolved during these decades. Thus, besides considerable discussion as to whether Bank rate operated through the quantity of notes or through the money market, the issue was also mooted as to whether quantity of note circulation, the cost of credit, or security prices communicated the first impact of Bank policy (Chapters 3 and 4). At no time during the period reviewed did any school clearly recognize the monetary significance of bankers' reserve balances; there was a virtual consensus

after 1844 that the power of the Bank lay in the mere magnitude of its operations on the capital market in comparison with other (and not essentially different) banks (Chapter 11). After 1844, furthermore, it was generally agreed, even by the Currency School proponents of the Act, who had wanted to construct a purely objective and mechanical governor of the currency, that discretionary management was inevitable (Chapter 15).

Finally, Wood presents to the student of money markets and banking mechanisms a scholarly and exhaustive analysis of the interrelations of various rates, of types of lending by the central bank, of the interrelations of Treasury and Bank operations, and of the various institutional peculiarities of the London money market (Chapters 5, 6, 7, 8, 12, and 13). For these chapters in particular a mere reading does not suffice, but laborious study would yield an intimate view of banking procedure in these decades.

Professor Wood's arduous researches leave little to be desired in the substance of his volume. Anyone but a special student of this period will be somewhat dismayed by the austerity of his style. Although the essentially difficult character of the subject matter would remain in all events, it might have been diminished somewhat had the author given his readers, by way of parenthetical exposition, something of a synopsis of the actual economic and monetary history of the period. For example, it escaped the reviewer's notice if the author explains why he has chosen the dates 1819 and 1858 as the temporal limits of his study. Technical terms are used throughout upon the not always safe assumption that the reader is thoroughly conversant with their connotations. On the other hand, so far as concerns the import of the more detailed parts of the analysis, Wood has obligingly summarized his findings at the close of each chapter and in a general concluding section.

Upon one theoretical point only would I incline to dissent. Wood expresses his preference for the "older approach" to the problem of prices over "the one through the Quantity Theory equation," on the ground that the latter leaves "in the background" (a) actual monetary procedures, (b) the criteria of effectiveness of monetary measures, and (c) business motives affecting credit (p. 59). None of these is a valid criticism of quantity-theory equations. As Marget has amply demonstrated in his *Theory of Prices*, a *correctly formulated* quantity equation *must* include the chief channels by which money and credit affect prices; and once it does so, that is all that is required. No one can legitimately expect a brief symbolic statement of these main forces to exhibit all the vast sea of individual economic decisions lying behind the significant economic aggregates, or in addition to a summary of the operative forces to provide a test of the effect of monetary policy. The entirety of monetary theory cannot be communicated in one breath.

Howard S. Ellis

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The Federal Income Tax, by Roy G. and Gladys C. Blakey. London, New York, Toronto: Longmans, Green and Co. 1940. xvii, 640 pp. $7.50.

Accounts of the passage through the Congress of the federal acts imposing taxes on income, similar to those which the authors have furnished to the *American Economic Review*, make up roughly two-thirds of this book. These accounts contain much that was of only ephemeral interest, and omit some things that were, and still are, significant. Particularly striking is the failure to indicate the part played by regulation in the development of the law. The impracticability of the provisions of the 1909 law calling for taxation of corporate income on a cash basis; the incongruity of combining with these provisions an allowance for depreciation; the Gilbertian solution of the administrative problem through regulations providing that obligations were "paid" when their existence was recognized by book entries, and the confusion over the meaning of the terms "paid" and "accrued" that resulted, are passed over without notice.

Again, the Act of 1917, levying taxes on a very different scale, was equally unworkable, so that regulations which were practically legislation had to be framed to deal with major problems. This was done, with the approval of the chairmen of the Congressional committees, largely by a group of unofficial advisors of the Commissioner of Internal Revenue. The legislative regulations included exemption from taxation of profits on involuntary sales upon the condition that the proceeds were applied to replacement, and a provision that notwithstanding the explicit statement in the law that debt should not be treated as invested capital, debts should be so treated where interest thereon was not an allowable deduction for excess profits tax purposes.

Most notable of all was the provision (retroactively approved in the 1921 Act), which first brought consolidated returns into the tax system. These regulations, and the influence of their sponsors, greatly affected the terms of the Act of 1918 and, indeed, were among the most potent influences in tax law and regulation for many years. No hint of these facts is to be found in the volume under review.

A chapter on "The Definition of Taxable Income" has obvious merits, but it is too brief to be adequate and it is not always accurate. The passage in which the authors suggest the classification of concepts of income so that anyone who wished might indicate that he was using the word in sense "A4.671," for instance, brings out admirably the extent of the existing confusion (page 507). The claim that an income tax embodies the principle of ability to pay is recognized as an exaggeration and in any event dependent for validity largely on the definition of income that is adopted (page 568). The authors incline to the Haig concept of income, though they are aware of its imperfections (page 506). This being so, it seems strange that they should so far succumb to the lure of the word "gross" as to treat sales, before deducting even cost of production, as gross income. They point out, of course that the Supreme Court has rejected this view in its interpretation of the 16th amendment.

The authors' discussion of depreciation, depletion, and timber stumpage, is particularly disappointing. The Supreme Court decisions that timber stumpage is, and depletion is not, a cost which must be deducted before there can even be gross income, might well have been discussed more fully.

Depreciation is dismissed in a paragraph in which the authors speak (without apparent justification) of the "enormity" of these deductions, and a single sentence gives a wholly misleading impression of the English practice (page 485). The facts are that in England a fixed percentage of annual rental value of buildings is allowed to cover maintenance of all kinds, and that depreciation is allowed on other assets in much the same way as it is allowed here, the English allowances, having regard to conditions in the two countries, being apprently the more liberal.

The authors lost an opportunity when they failed to point out the striking contrast between the English law of 1932 ,which accompanied an increase in the rates of tax by an increase in depreciation allowances, and the attitude in 1934 of our Congress, which sought to increase revenue partly by increasing rates and partly by reducing depreciation deductions, or in other words, taxing as income what is really capital.

The statistical tables are not important. They are largely taken from partisan presentations in support of measures proposed. An undesirable type of statistical table is illustrated by Exhibits 12 and 13 (pages 594–5), in which estimates are given of the increase in tax yield that would have resulted from the discontinuance of consolidated returns, on the assumption that no changes in corporate procedure to meet the situation would have been made. This, notwithstanding that the Treasury's main argument for allowing the continuance of consolidated returns was that changes in inter-corporate transactions would quickly destroy any apparent gain from abolition of the practice.

The volume contains many shrewd comments and useful suggestions, but it cannot be said to be the definitive history of income tax laws or to add greatly to existing knowledge of the subject.

George O. May

New York City

Capital Expansion, Employment, and Economic Stability, by Harold G. Moulton, George W. Edwards, James D. Magee, and Cleona Lewis. Washington, D. C.: The Brookings Institution. 1940. xv, 413 pp. $3.50.

The authors of this volume consider the absence of a large measure of capital expansion to be the feature which most strikingly distinguishes 1933–39 from former periods of economic recovery. "This fact," they state, "is conceded to go far toward explaining the low level of economic activity, the unprecedented volume of unemployment, and the reservoirs of idle funds" in existence today. The authors find that the restricted flow of funds into investment cannot be explained by abnormal conditions in the private

capital market. There is a substantial volume of investment money, and a plethora of short-term credit resources; and there is sufficient underwriting capital. Industrial corporations, large or small, cannot finance all potential capital requirements from internal sources, although the financial position of American corporations is on the whole reasonably satisfactory as a basis for credit. The authors look, therefore, to government regulations and policies for the explanation. The costs, delays, and restrictions inherent in certain sections of Federal and state security market regulations have been a contributing, though not a major factor. More important is taxation, which has encouraged investment in high-grade bonds, particularly tax-exempt issues, and has discouraged investment in equity securities; whereas the primary need at present is the expansion of capital enterprise through the medium of stock flotations. Further, indirect and largely psychological factors stemming from the persistence of huge fiscal deficits and the development of the philosophy of the permanently unbalanced budget have lessened the disposition of both investors and enterprisers to make long-term capital commitments. The authors conclude that "the reestablishment of the stable conditions which are so sorely needed . . . largely depends upon the removal of unnecessary impediments to the flow of funds into constructive capital developments and the restoration of confidence in the future of private enterprise."

Very little is actually said about "employment" and "economic stability." The volume is, in fact, almost entirely devoted to the question of "capital expansion." Yet on this question the argument is uneven in respect of factual evidence and theoretical detail. No evidence is offered in support of the view, stated to be "generally regarded," that the failure of capital formation to advance to the pre-depression level of 1929 is a distinguishing characteristic of the economic recovery of 1933–39. The possibility that a similar situation may have existed in earlier periods, such as in the 1890's, is not discussed. Nor is there full recognition of the possibility that the volume of investment during the pre-depression period, 1923–29, was unusually high. It is difficult to concede the validity of the statement that the low level of investment "explains" the low level of economic activity and of employment. The reverse does not seem any less true. Causal relations of a Keynesian kind, if the authors have these in mind, are not brought out into the open. As part of the argument the authors claim to prove the existence of a superabundance of investment money. Just what meaning is to be ascribed to the term "superabundance" it is difficult to say, especially since the authors consider the low level of prevailing interest rates to be "confirmation." What is needed here and elsewhere in the volume is a section on concepts to which the reader can turn for definitions of such terms as "savings," "investment," "capital expansion," and "superabundance of funds." The distinction between gross and net investment especially needs to be made clear. On the last and perhaps crucial point, the question of "confidence," little concrete evidence is given, and the theoretical discussion also is inadequate. Since the

Federal deficit has in fact been financed by the sale of securities, and since there was some considerable expansion of private investment from 1933 to 1939, the relation between the state of "confidence" and the rate of capital expansion must be intricate.

The volume contains a large collection of statistical data on new issues, corporation finances, and related matters. The inclusion of doubtful series like those of the *Journal of Commerce* on new issues detracts, however, from the value of the collection. Similarly, there is an absence of critical annotation. For example, the Statistics of Income corporate data for 1926–37 are used as if they were strictly comparable from year to year. Changes in the number of corporations reporting balance sheets and the unscrambling of consolidated reports which occurred in 1934 are overlooked. In some sections of the volume, the data are misused. For example, the authors treat corporate savings as equal to changes in assets, thus ignoring the fact that changes in liabilities may and do occur. Depreciation and depletion charges are considered to measure the dissipation of fixed assets—even though current assets may be liquidated, if need be, to maintain fixed assets.

Solomon Fabricant

National Bureau of Economic Research

Capital Investment in Africa, its Course and Effects, by S. Herbert Frankel. New York: Oxford University Press. 1938. xvi, 487 pp. $4.00.

The author of this book is Professor of Economics and Economic History at the University of Witwatersrand, Johannesburg. It is issued by the Committee of the African Research Survey under the auspices of the Royal Institute of International Affairs.

The study concerns particularly the three-quarters of the African continent south of the Sahara and Abyssinia. This area comprises 8¼ million square miles, which is equivalent to the area of Soviet Russia in Europe and Asia, and nearly three times that of the United States. The population includes about 100 million people, of which some 2½ million are whites.

The author considers the process through which Africa is being incorporated into the world economy—notably, the process of capital investment. He points out, however, that the process of capital investment serves as the fountain head of economic progress in that it in turn stimulates changes in traditional methods, in occupations, and in forms of economic activity.

The penetration of Africa by Europeans is obviously something very different from the penetration by Europeans into the North American continent. This follows from the fact that in most parts of Africa the European settlers encounter a virile race. Moreover, the Europeans have not found it possible to engage in economic activities in Africa without utilizing the labor of the native peoples. The basic economic fact in the European penetration of Africa is the dependence upon black labor. This labor indeed is the greatest asset which Europeans possess for the development of the resources of

Africa. The native labor would not offer its services voluntarily because the indigenous economy of the natives fulfilled all their simple wants. It has therefore been necessary to establish systems of "forced labor."

The methods of compulsion still used are numerous. They range from directly applied force to milder methods of conscripting labor, or indirect methods such as taxing natives to force them to work. Expropriation of native land is another factor. Once the natives' land is gone, there are no alternative means of living except by working for others, and this of course is a factor tending to hold wages at a very low level.

Frequently investment of foreign capital has taken place on the assumption that labor would continue to be available at low wage rates. Vested interests thus are created which tend toward policies which insure a supply of labor at established rates.

Mineral industries can be carried on by a technique which utilizes large numbers of unskilled laborers. Where mineral and other similar resources are lacking, development requires the creation of systems of peasant production and the introduction of new products and new methods. This involves large capital expenditures on communications and public works, and so governments have had to take an active part in such capital investments. Large foreign investments, moreover, create the necessity of forcing exports as a means of meeting the service on the debt.

This tends to drive projects into money crops for export. But the undue expansion of export crops exposes the territory to the industrial fluctuations of world markets.

The author points out that investment in Africa is thus bound up with far-reaching political and sociological issues, which include public investment, fiscal policy, monopolistic and sectional interests, and quite exceptional social techniques and institutions, particularly with respect to labor.

The author discusses the investment of leading countries, particularly in the period from 1870 to the time of the World War, and the role of the chartered companies in the African development. He discusses the geographical obstacles to colonization and the lack of transport. He devotes special attention to the development of the Cape in its early history. Beginning with the late sixties, new wealth was discovered in South Africa in the form of diamonds, and here began a great development of foreign capital investment. In 1880 twelve companies were in the field, and there followed rapidly a speculative mania in which a large number of new companies were floated. Toward the end of the eighties consolidation and amalgamation began to develop until finally diamond production and trade became highly centralized in a great diamond amalgamation. In the late eighties and early nineties came the development of gold production, which opened up important new channels for investment. Then came the economic revolution in SouthAfrica.

The author discusses at length the impact of the gold industry upon the economic development of South Africa, the fluctuations in the supply of capital, the amount invested and the net return. He treats the economic

structure of the Union of South Africa, the role of its foreign trade, the dependence on mining and the taxation of gold mining, and the efforts to develop agriculture and manufacturing. He discusses the unequal division of the national income, the alleged shortage of native labor, which he argues is a function of the extraordinary artificially low rate of pay, and the various obstacles to investment. More than anything else, he argues, the economic progress of the country depends upon the ability to organize the labor force of the population and to educate and train its backward members.

The author devotes a large part of the book to a discussion of the articulation of the African economy with the world economy. This involves not only a discussion of investment, mining, and trade in the Union of South Africa, but also a discussion of the mandated territory in South Africa, southern and northern Rhodesia, East Africa, and other territories, including colonies and protectorates. He also gives an extensive discussion of the Belgian Congo, Nigeria, the Gold Coast and French Africa, Portugese East Africa, and the Anglo-Egyptian Sudan, and devotes one section to African railway finance.

In his conclusion he points out that Africa is mainly a producer of raw materials, the demand for which depends mainly upon a rising standard of living in Europe and in America, and on the other hand, through the ensuing high value of exports, a rising standard of living in Africa.

The extraordinary influence of mining, particularly gold mining, raises of course the important question of what is to become of gold after this war and how will this affect African development. A German domination of the whole of Europe would itself greatly restrict the monetary use of gold, and in the event of a breakdown of the British Empire one may foresee the doom of the gold mining industry. It should be added that, while this certainly creates a serious problem for Africa, general world demonetization of gold does not imply, as many have supposed, any serious problem for the United States.

The volume under review is extremely valuable, rich in factual material and in its interpretation of the role of Africa in the world development.

Alvin H. Hansen

Harvard University

A Statistical Study of the Drawing Power of Cities for Retail Trade, by John Adams Pfanner, Jr. Chicago: The University of Chicago Press. 1940.xii, 81 pp. $1.00.

This study aims: first, "to measure the volume and relative importance of non-resident trade in certain groups of commodities for a selected group of cities," and second, "to measure the affect of certain factors upon the drawing power of a selected group of cities for trade in several groups of commodities."

The commodities given special attention are jewelry, silverware, and clocks, women's apparel, furniture and automobile accessories; and the

factors bearing on drawing power are chiefly size and location. These are studied for a list of ninety cities.

The material is drawn chiefly from the Distribution Census of 1930, and the techniques are the statistical methods of computation available for interpretation of such data.

There might be some question about the validity of the author's assumption that states are satisfactorily self-contained trading areas (concerning which he seems to entertain enough doubt to call for several pages of defense), but the methods followed in handling the data are ingenious and suggestive.

When the new census figures are available, with their presumably greater accuracy and greater fullness, it would be worth while, as a statistical *tour de force* if not as a marketing aid, to follow this study with a fuller one for more commodity groups.

PAUL T. CHERINGTON

New York City

Economic Consequences of the Seven-Hour Day and Wage Changes in the Bituminous Coal Industry, by Waldo E. Fisher. Philadelphia: University of Pennsylvania Press. 1939. xv, 130 pp. $2.00.

Signing of a contract by representatives of bituminous coal operators and by the United Mine Workers of America in April, 1934 reducing hours of work and raising rates of pay, together with the availability of detail respecting costs and income arising from the operations of the National Recovery Administration, permitted the author to use the bituminous coal industry as a case study of the economic effects of wage increases and hour reductions.

In brief, trends in sales income and costs were followed for the period from November, 1933 to January, 1935 with special emphasis laid on comparisons of months in the winter of 1933–34 with months of comparable production in the winter of 1934–35. Available statistics on output per man per day, number of employees, man-days, days worked by mines, production, mechanical loading of coal, mine accidents, and per capita income of employees were brought together for a period of years and analyzed with respect to the changes occurring from time to time in hours and wage rates.

Immediate effects of the 1934 agreement were (a) increases on a per ton basis in all major cost items, particularly in labor costs, selling expenses, and costs of supplies; (b) a reduction in output per man per day; and (c) increases in the number of men employed and man-days worked per million tons. Increases in sales income, made possible by the power granted the Code Authority to regulate prices under Federal supervision, were more than sufficient to absorb the increased costs. Per capita income, both nominal and real, of full time wage earners was substantially greater.

In the years following 1934, further adjustments were made as a result both of the 1934 agreements and of later increases in rates of pay in 1935 and 1937. Output per man per day rose, in part, at least, as the result of a sharp rise in the introduction of mechanical loading equipment. In consequence, by 1937 the number of men employed per million tons had fallen 12 per cent below the 1933 level, and the number of man days worked per million tons declined to only a little above the 1933 level. Per capita earnings, nominal and real, continued to rise through 1937, whether based on the actual number of days worked per year or on a constant number (in order to eliminate effects of cyclical fluctuations in the demand for coal).

Since a substantial reduction in hours of work took place at the same time that rates of pay were increased, the author could not segregate the effects of one or the other of these actions. However, it should be pointed out that increases in certain cost items were the result of the reduction in the working day alone. For example, the increases in administrative costs and in the cost of supplies no doubt arose chiefly from the necessity of providing more supervision, clerical labor, and supplies for larger mine labor forces.

One of the chief problems in the administration of minimum wage laws is the determination of the probable effects of the proposed minima on labor costs, total costs, and selling prices. With data available on the distribution of workers according to rates of pay, and with data on the total wage bill and its relation to total costs and total value of product, it is a simple operation to determine percentage increases which would follow the raising of all workers below the proposed minimum to the minimum. Little or no information is available on the extent to which the wages of those already at the minimum or above would be raised in order to maintain differentials for differences in skills, responsibilities, or length of service. That such increases take place is known, but no technique and little data are available to estimate their importance. This study of the bituminous coal industry throws no light on the problem since the wage increases applied to the entire wage scale.

Theodore A. Veenstra
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Personal Finance Companies and Their Credit Practices, by Ralph A. Young and Associates. New York: National Bureau of Economic Research. 1940. xix, 170 pp. $2.00.

This volume is the first fruit of an investigation of the installment financing of consumers, undertaken in 1938 by the National Bureau of Economic Research. Five further studies are promised, the last one to be a study of the relation between consumer installment financing and economic stability.

It will be noted immediately that the term "installment financing" is used

here to include more than the sale of consumer goods on time. Personal finance companies do a cash loan business but are included in this investigation as, with few exceptions, are all other concerns which extend consumer credit entailing the repayment of principal and interest in prescheduled amounts at regular intervals.

The book is a brief but comprehensive survey of the business carried on by the personal finance companies which operate under the Uniform Small Loan Act or under acts modeled on it. Other agencies make small loans, as do credit unions, industrial banks, and the personal finance departments of commercial banks, and these we assume will be subject to scrutiny in the other volumes. The reader gets a picture first of the personal finance companies as business units. Then follows a discussion of their market and a description of their method of doing business. The chapter on credit standards which comes next is probably the most significant chapter of the book as it covers ground least worked by other students of these companies. The remaining chapters are devoted to a discussion of expenses and income, rates of charge, the effect of changes in legal rate, and relations among the lenders.

In reading this book, there are three points to be kept in mind. The first is the relation of supervision to bad-debt loss. Loss in this business is closely related to business management. Supervision is a way of eliminating loss. It is a heavy expense but without it the loss would be very much greater. The second point is that this business rests on trained man power which has been carefully educated to make certain types of loans and to reject others. Likewise the art of collection is developed to a high degree. The third point is the relation of the charge to the kind of business done. Statistics on results of operation must always be interpreted in the light of these conditions. The newcomer in the business might find his year-end results to be quite different from those given in this volume, which in the main reflect the operations of large successful companies.

The authors estimate the volume of receivables of personal finance companies in 1937 at $400,000,000, about two fifths of the receivables of all consumer cash lending agencies. In the light of these figures, it is easy to understand why commercial banks have entered the field of consumer finance.

This book does not attempt to weigh the pros and cons of consumer borrowing. It is a study of the business of personal finance companies. The effect of all this borrowing on the lives, habits, and morals of the people is not considered. Now it is still the custom to look with a jaundiced eye on consumer debt. As stated earlier, the authors inform us that the final volume will indicate the relation of consumer financing to economic stability. In a way, economic stability rests on people, and it is to be hoped that the borrowers themselves will also appear in some self revealing, nonstatistical way in this final volume.

As this book indicates, the personal finance business has made steady progress under the guiding auspices of the Russell Sage Foundation. It is peculiar in that it has submitted to an overall leadership and welcomed close

and careful state supervision and control. In this, there is food for thought. The book should be, therefore, a welcome addition to the library of the man who is seeking to learn how business can or will be conducted as the sense of social responsibility increases.

Louis N. Robinson

Swarthmore, Pa.

International Boundaries: A Study of Boundary Functions and Problems, by S. Whittemore Boggs. New York: Columbia University Press. 1940. xvii, 272 pp. $3.25.

This book by the Geographer of the Department of State, strongly endorsed in a foreword by the dean of American geographers, Isaiah Bowman, President of Johns Hopkins University, comes at a time when boundary problems of World War II are being raised. Mr. Boggs, by this exposition of the status of the world's 100,000 miles of international boundaries, provides an arresting factual basis for a peaceful readjustment at the close of hostilities. It clearly is a common responsibility to take stock of the character of international boundaries and to make mental preparation for a future equitable compartmentization of national interest, one making for international harmony.

This book divides into four distinct parts: (1) a discussion of the changing role of boundaries; (2) a summary of the literature dealing with boundary classification; (3) an areal analysis of the situation in the five great continents; and (4) appendices giving boundary lengths, and treaties, conventions, protocols and commission decisions relative to certain boundaries. Facts, not weak Utopian generalization, set the tone.

An interesting contribution is made by a table giving the number of boundary miles per 1000 square miles of area for each continent. Such a comparison reveals the critical character of Western Europe, which excluding the U.S.S.R., outranks all competitors nearly three fold. Still more striking is the result when this boundary mileage is multiplied by the square mile population density of each continent. This reveals Western Europe, if one may indulge in metaphor, as a house with many small rooms, each crowded by a family of eight in contrast to one person or less per room elsewhere. By way of further contrast, pertinent comparisons are drawn between the United States and Western Europe. Our boundaries, established before settlement had passed the frontier stage, are shown to operate more simply and with less friction than those of Western Europe. Furthermore, we have made adequate provision to handle boundary problems by referring them to commissions competent to deal with the manifold situations which arise. For example, our Canadian boundary in the Detroit area is shown to be satisfactory notwithstanding the complexities of modern industrialization.

In the case of South America Mr. Boggs indicates that two official lan-

guages, relatively low population density, and the absence of marked contrasts between industrialized and agricultural areas in boundary regions, have resulted, with few exceptions, in a relatively frictionless, simple situation. In Asia, likewise, boundaries perform relatively simple functions, functions associated, for the most part, with vast undeveloped areas. Finally, it is asserted that in Africa boundaries drawn in haste by European masters without concern for indigenous population can only lead to a multiplication of internal and external dissatisfactions and frictions as differences in governmental policy relative to trade, education, and communication, produce differentials in economic development.

For the author only a peaceful solution can suffice, for "if boundaries are removed by force, the internal problems engendered by the amalgamation of unwilling people would probably sterilize all possible benefits." This prophesy augurs ill for the sweeping military elimination of boundaries by Hitler. One cannot escape the conjecture that the roof of the house of Europe will fall when the walls of its narrow rooms are dynamited.

Mr. Boggs, having participated in the settlement of several boundary controversies, is too acutely aware of the difficulties involved to propose any simple solution. In closing he states: "In order that boundary problems may be amicably solved, every conceivable factor should be taken into consideration when new frontiers are to be established, and the best human wisdom should be applied in placing the boundary where it promises to function with least friction and to occasion a minimum of expense. Once the boundary has been established, the functions which it serves should be kept as simple and nonirritating as possible. Progressive simplification of boundary functions is needed in nearly all parts of the world in which boundary friction has developed. Finally, provision should be made for prompt, impartial, and wise handling of incidents and disputes that do arise."

MALCOLM J. PROUDFOOT

Bureau of the Census

People, the Quantity and Quality of Population, by Henry Pratt Fairchild. New York: Henry Holt and Company. 1939. 315 pp. $2.25.

Professor Fairchild writes for the popular reader, in this case the totally uninformed reader. Judged in this light the book is well done. It covers in the main familiar ground—the geometrical ratio, the population growth of the nineteenth century correlated with the advance of science and the development of capitalistic industry, the geographical expansion of European peoples, the declining birth rate, and the approach of stationary or declining populations. There are incidental discussions of simple vital statistics concepts which might better have been collected in a separate section or chapter.

The treatment of the "optimum" concept is discriminating. The economics of the book is not profound, but the author rightly regards the population problem as essentially a problem of the standard—or as he prefers to

call it, the level—of living. The problem is regarded fundamentally as a quantitative relation between the size and the quality of population, natural resources, and "economic culture," the latter being practically equivalent to the efficiency of the technology of the productive process. Professor Fairchild believes that overpopulation has been the rule. As a broad generalization, and taking overpopulation in relation to the optimum possible at any given time and place, this view is probably correct, although there are exceedingly few persons who can be made to see it.

The treatment of the international aspects of the population problem, which are now certainly among the most significant, is sketchy. Professor Fairchild believes that most wars have been due to population pressure—a view the validity of which depends on the definition of terms. It would be nearer the truth to say, as E. A. Ross pointed out many years ago, that population pressure is frequently the alleged excuse for aggressive warfare. The cry for Lebensraum is in the main a cloak for jealousy of other peoples' standards of living.

The book closes with two chapters on eugenics which are well worth reading. Considerable space is given to the history and philosophy of the birth control movement.

A. B. Wolfe

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Social and Biological Aspects of Mental Disease, by Benjamin Malzberg. Utica, New York: State Hospitals Press, 1940. iv, 360 pp. $2.50.

The change which has taken place during the past few decades in the conception of the nature of mental disease has stimulated research concerning its causes and the appropriate methods of treatment. This book presents an analysis of the statistical records of one of the best administered systems of State care of the mentally diseased in this country, that of New York State. Opening with an introductory affirmative answer to the much debated question of whether the proportion of the population who during their lifetime develop some form of mental disease is increasing, the author then discusses the relationship of mental disease to a variety of demographic characteristics, age, size of community, marital status, nativity, parentage, and race. The development of mental disease decreases the marriage rate and length of life of the persons affected. The first-born will be cheered by evidence that they are no more likely to develop mental disease than their younger brothers and sisters. After a rather cursory discussion of the influence of economic conditions and literacy upon mental disease, the author concludes with an analysis of the results of insulin treatment of patients with dementia praecox.

This book is essentially a reprint of a number of articles which previously appeared in different journals. As such it lacks a central coordinating theme and gives the impression of being a collection of papers related only by the

fact that each discusses some aspect of the problem of mental disease. The same "straw man," crude rates of mental disease, is killed in each chapter. While this may be both necessary and appropriate in a series of articles published in separate journals, one grand slaughter would seem to be sufficient for one book.

The author fails to discuss the accuracy and validity of the basic data but accepts them at their face value, although it is well known that the diagnosis of psychoses is still a matter of opinion upon which it is difficult to obtain agreement. Without producing any convincing evidence, the author expresses his belief that the increasing rate of first admissions results from an increase of mental disease in the population. This belief leads to the neglect of alternative explanations of many relationships demonstrated throughout the book.

About one-fourth of the book is devoted to a vigorous assault upon the widely quoted statement that the foreign-born are more likely to develop mental disease than the native-born. Although the conclusion that whatever differences exist between the native- and foreign-born result from environmental rather than from biological factors is correct in the reviewer's opinion, nevertheless it should be pointed out that the comparisons made in the book would have been much less favorable if the foreign-born had been compared with the native-born of native parentage instead of with the total native-born.

These criticisms should not be interpreted as implying that the book is of little value. On the contrary, it is well worth the attention of persons interested in a statistical description of the relationship of mental disease to a variety of demographic factors. The statistical material has been handled in a competent manner and has been capably used, not only to correct erroneous ideas concerning the mentally diseased, but also to extend our knowledge concerning new aspects of mental disorders.

HAROLD F. DORN

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